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Pacific Northwest Site Office
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Richland, Washington 99352

07-MGR-0045

FEB 15 2007

Mr. Michael Kluse, Interim Director
Pacific Northwest National Laboratory
Richland, Washington 99354

Dear Mr. Kluse:

CONTRACT NO. DE-AC05-76RL01830 – FY 2006 YEAR END EVALUATION OF
BATTELLE FOR MANAGEMENT AND OPERATION OF THE PACIFIC NORTHWEST
NATIONAL LABORATORY (PNNL)

Enclosed is the DOE FY 2006 Year End Evaluation Report of Battelle's management and operation of PNNL. The basis for the evaluation centered on the performance expectations found within each of the common Office of Science (SC) Performance Objectives and Goals. The overall grade for the eight Goals, along with a short summary of the performance results, is provided below. This was the first year utilizing the new SC Performance Appraisal Process which provides a common structure and scoring system across all ten SC Laboratories. This new process focused on the value-added provided by the contractor and the systems put in place to manage and operate the laboratories as demonstrated by performance results throughout FY 2006. An annual performance assessment meeting with SC senior management adds additional rigor to ensure the scores and grades awarded represent a fair and equitable assessment of the contractor's actual performance. This process has also incorporated a new scoring system (0 - 4.3), with corresponding grades (A+ - F) that replaced the previous adjectival rating system. A score/grade of "B+" was awarded for performance results that met the "expected" performance level for an Objective. Therefore, scores/grades above a "B+" indicate a degree of performance that exceeded expectations while correspondingly lower scores/grades indicate degrees of performance which has not met overall expectations. The grade for each of the Goals was determined based on the weighted sum of the scores associated with its individual Objectives. The table below indicates the scale utilized for assigning scores and letter grades.

Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0

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The DOE review concluded that Battelle's performance generally exceeded expectations within the Science and Technology (S&T) Goals (Goals 1.0 – 3.0) as evidenced by the evaluations provided by each of the DOE Headquarters Program Offices and other customers. Although Battelle's performance within the Management and Operation (M&O) Goals and their corresponding Objectives met the Department's expectations in some areas, DOE's assessment of a number of Objectives indicated that Battelle was not consistently achieving the expected results.

- **Goal 1.0 – Mission Accomplishment (A+):** Battelle met and in most cases exceeded expectations in delivering S&T results that contributed to and enhanced DOE's and other customer missions. The Office of Biological and Environmental Research (BER) indicated that the Laboratory research program is a world leader in proteomics, atmospheric science and environmental molecular science. The Office of Basic Energy Sciences (BES) noted that Chemical sciences (catalysis and experimental and theoretical condensed phase chemical physics) and geosciences research programs continue to demonstrate outstanding scientific progress and significant impact, while the Office of Advanced Scientific Computing Research (ASCR) indicated that Battelle's efforts in the core mathematics and computational science research program have made significant contributions in these areas. The Office of Defense Nuclear Nonproliferation (DNN) reported that the Contractor has consistently done an outstanding job developing and maintaining a wide range of competencies of great importance to DNN. The evaluation from the Assistant Secretary for Energy Efficiency and Renewable Energy (EERE) indicated that the Contractor's leadership in catalysis has lead to significant advances in the field of diesel NOx adsorber technology and their outstanding synergy between basic and applied science can be seen within the Hydrogen, Fuel Cells, and Infrastructure Technologies program.
- **Goal 2.0 Design, Fabrication, Construction and Operations of Facilities (A):** The SC assessment of the Environmental Molecular Sciences Laboratory (EMSL) indicated that it has exceeded expectations. EMSL and PNNL management and staff are commended for the strong and effective response to the 2005 EMSL reviews; for their proactive and innovative management processes; and for their collaborative and collegial approach to interactions with BER and the Site Office. The EMSL targeted reintegration of Laboratory talent was noted and is expected to result in increased scientific productivity for both entities. BER also noted that Battelle has effectively utilized the Atmospheric Radiation Measurement (ARM) facility to support the Laboratory research on clouds and aerosols and was given high marks in two recent reviews.
- **Goal 3.0 S&T Research Project/Program Management (A):** Battelle met and in many cases exceeded expectations in providing effective and efficient S&T research project/program management. BER indicated that Battelle planning and management continues to set the standards in S&T technology research project/program management calling out the planning and management tools and documents developed for EMSL and their

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impact in achieving program objectives. Materials sciences and chemical sciences research programs, as assessed by BES, have demonstrated effective leadership and clear strategic planning and ASCR reported that Battelle's contributions to the vision, planning, and coordination of high-performance computing is significant, though more so in Work for Others than for SC and it is not always reflective of the budget realities in SC. The U.S. Department of Homeland Security's assessment noted that overall performance met or exceeded expectations and minor issues were either resolved and/or are being addressed, adding that the Contractor is a professional organization, and to their credit, listens to their customers requirements and aggressively responds. EERE noted Battelle's exceptional management of the Building Energy Codes Program under extremely adverse conditions. The Office of Environmental Management (EM) indicated that Scientists provided high-quality scientific and technical expertise in areas of high-level waste such as evaluation of low-temperature immobilization technologies and subsurface science; however, Battelle has not always been effective in leveraging research and expertise across the Laboratory in order to provide the best input for EM.

- **Goal 4.0 Leadership and Stewardship of the Laboratory (B-):** Battelle met the expectations in enhancement of the Laboratory vision and linkage to the DOE missions. The Laboratory Strategy outlines planned outcomes and milestones required to deliver high value to each mission and the linkage between the Strategy and the business planning process continued to be strengthened. However, some other expectations within this goal were not met. The major areas of concern are related to the FY 2006 results/progress associated with the Capability Replacement Laboratory (CRL) Project, the Laboratory Assurance Process, and Business Process Improvement Project (BPIP). The Battelle corporate assurance process implementation has not addressed the stipulations associated with the DOE conditional acceptance, and there is little evidence that governance has strategically defined the success parameters and associated risk boundaries for the assurance process. With respect to the CRL, the Contractor's response to issues raised on the project were slow and often non-responsive until directed by DOE. Battelle struggled with the 300 Area strategy and the CRL Project leading to a very negative meeting with the Deputy Secretary of Energy. While leadership at Battelle seemed engaged in some key aspects of the CRL Project and BPIP, the involvement was typically reactionary in lieu of systematic involvement through the corporate performance assurance process. Battelle did actively intervene late in the year on the CRL Project, resulting in a major change in acquisition strategy to satisfy project constraints.
- **Goal 5.0 Integrated Safety, Health, and Environmental Protection (B+):** Overall the Contractor met most of the expectations for this Goal with some notable areas of increased performance, and one area that did not meet expectations. Despite not meeting the FY 2006 target for TRC, the recordable case rate improved over last year's rate and the DART rate met the FY 2006 target and improved over last year. Significant progress has been made in development of an Integrated Safety Management (ISM) measurement framework, and particularly in development of a process to analyze data results and to provide credible conclusions for management decision. Noteworthy performance improvement actions were

also noted in the areas of safety leadership and focus on 24/7 safety resulting in improved performance. Areas of concern related to ISM system performance include documentation of safety related to offsite work, integration of safety into the CRL Project, implementation of the experimental authorization process, and the establishment of efficiency measures. While waste management, minimization, and pollution prevention programs have been highly effective, limited progress was achieved in defining the systems and controls necessary for the Start-Clean Stay-Clean concept, Unneeded Chemicals and Materials disposition, and CRL future waste management needs.

- **Goal 6.0 Business Systems (B-):** Although Battelle met or exceeded performance on two of the Objectives under this Goal, there were mixed performance results on the remaining three Objectives. Noteworthy progress in addressing areas of concerns from prior performance periods was noted and significant improvements have been made in the Financial and Acquisition Management Systems. Nonetheless, additional improvements are still warranted and the overall level of performance in these systems has not yet achieved the expected level of performance. We are, however, very encouraged by the Contractor's efforts in strengthening and improving these management systems and are hopeful that these improvements will yield improved performance results in future performance periods. Also noted was a need to further institutionalize the Laboratory's Core Business Processes as well as formalize the measurement basis for it. Performance in the Human Resources and Intellectual Property management systems continued to be noteworthy. Battelle is to be commended for the success of diversity outreach initiatives, increasing representation of women and minorities within the Laboratory. In the area of Intellectual Property, the Laboratory was recognized with four FLC awards and five R&D 100 awards during this reporting period.
- **Goal 7.0 Operating, Maintaining, and Renewing Facility and Infrastructure Portfolio (C):** Battelle's appropriate planning and management of existing Laboratory facilities and infrastructures provided high facility reliability, energy efficiency, and operational effectiveness allowing the Laboratory to effectively conduct its mission without undue interruption or delays. However, most performance expectations to provide planning for and acquire the facilities and infrastructure required to support future Laboratory programs were not met. Successes were limited to timely submittal of the FY 2006 Ten Year Site Plan, and improvements in small project management discipline. Most key aspects associated with the planning, acquisition, and execution on the CRL Project failed to be successful. Failure to adequately integrate safety into the CRL conceptual design at Critical Decision (CD)-1 resulted in significant rework and invalidated the acquisition strategy ability to achieve the mission need within the cost and schedule objectives. Additionally, the CRL/Physical Sciences Facility (PSF) technical, cost, schedule, and management review (Lehman Review, January, 2006) noted substantial technical and management deficiencies with the CRL Project. These deficiencies resulted in a schedule delay for the planned CD-2 date and the failure to obtain approval of the Alternative Financing Business Case.

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- **Goal 8.0 Integrated Safeguards and Security Management and Emergency Management Systems (B+):** Overall the Contractor met expectations for this Goal with no notable areas of increased or diminished performance. Significant progress in configuration management and patch management has reduced the vulnerability to Cyber attacks, providing for an effective, efficient, and compliant cyber-security program. The DOE assessment indicated that classified and sensitive information assets are appropriately protected as demonstrated through a proactive incident reporting, tracking and inquiry process, and an effective Security Education and Awareness program, both of which continue to foster a healthy security culture at the Laboratory. Battelle also maintained an efficient and effective emergency management program throughout the evaluation period.

Notwithstanding the performance issues and concerns noted within the report, Battelle's overall performance throughout FY 2006 has been positive. We recognize that Battelle has implemented corrective actions to address a number of the deficiencies noted above, and continue to improve the internal control systems utilized to achieve the expected results. However, continual management attention and focus is needed to ensure the improvements are effective. We look forward to working with you throughout FY 2007 to enhance the value of the Laboratory to the missions of the DOE and the Nation.

If you have any questions, please contact me, or your staff may contact Terry L. Davis of my staff on (509) 372-4612.

Sincerely,



Julie K. Erickson
Acting Manager

MGR:TLD

Enclosure:
FY 2006 Year End Evaluation
for Battelle

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DOE Office of Science

FY 2006

**Performance Evaluation of
Battelle Memorial Institute
for the
Management and Operations of the
Pacific Northwest National Laboratory**

February 2006



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I. OVERALL SUMMARY RATING/FEE

Performance-Based Score and Adjectival Rating:

The basis for the evaluation of Battelle Memorial Institute's (the Contractor) management and operations of the Pacific Northwest National Laboratory (the Laboratory) during FY 2006 centered on the Objectives found within the following Performance Goals:

- 1.0 Provide for Efficient and Effective Mission Accomplishment (Quality, Productivity, Leadership, & Timeliness of Research and Development)
- 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operations of Facilities
- 3.0 Provide Effective and Efficient Science and Technology Research Project/Program Management
- 4.0 Provide Sound and Competent Leadership and Stewardship of the Laboratory
- 5.0 Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health, and Environmental Protection
- 6.0 Deliver Efficient, Effective, and Responsive Business Systems and Resources that Enable the Successful Achievement of the Laboratory Mission(s)
- 7.0 Sustain Excellence in Operating, Maintaining, and Renewing the Facility and Infrastructure Portfolio to Meet Laboratory Needs
- 8.0 Sustain and Enhance the Effectiveness of Integrated Safeguards and Security Management (ISSM) and Emergency Management Systems

Each Performance Goal was composed of two or more weighted Objectives and most Objectives had a set of performance measures, which assisted in determining the Contractor's overall performance in meeting that Objective. Each of the performance measures identified significant activities, requirements, and/or milestones important to the success of the corresponding Objective. The following describes the methodology utilized in determining the Contractor performance rating.

Each Objective within a Goal was assigned a numerical score by the evaluating office. Each evaluation measured the degree of effectiveness and performance of the Contractor in meeting the Objective and was based on the Contractor's success in meeting the set of Performance Measures/Targets identified for each Objective as well as other performance information available to the evaluating office from other sources to include, but not limited to, operational awareness (daily oversight) activities; "For Cause" reviews (if any); other outside agency reviews (OIG, GAO, DCAA, etc.), the Contractor's self-evaluation report, and the annual 2-week review (if needed). If no performance measures/targets were utilized the description of the general expectations for the success of the objective was utilized as the baseline of the effectiveness and performance of the Contractor in meeting the corresponding Objective and in determining the score assigned. The Goal score was then computed by multiplying the numerical score by the weight of each Objective within a Goal. These values were then added together to develop an overall score for each Goal. This score was then compared to Table A to determine the overall grade for each Goal. A set of tables is provided at the end of each Performance Goal section of this document to assist in the calculation of Objective scores to the Goal score. The raw score (rounded to the nearest hundredth) from each calculation was carried through to the next stage of the calculation process. The raw score for Science and Technology and Management and Operations was rounded to the nearest tenth of a point for utilization in determining fee as discussed below. A standard rounding convention of x.44 and less rounds down to the nearest tenth (here, x.4), while x.45 and greater rounds up to the nearest tenth (here, x.50).



Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0

Table A. FY 2006 Contractor Letter Grade Scale

Based on the evaluation of Battelle's performance against the Goals and Objectives contained within the FY 2006 Performance Evaluation and Measurement Plan (PEMP) the scores and corresponding grades awarded for each Goal are provided within Table B below. Specific information regarding the Contractor's performance in meeting each of the Goals and their corresponding Objectives is provided within Section II of this report.

S&T Performance Goal	Numerical Score	Letter Grade	Weight	Weighted Score	Total Score
1.0 Mission Accomplishment	4.06	A+	55%	2.23	
2.0 Design, Fabrication, Construction and Operations of Facilities	4.0	A	8%	0.32	
3.0 Science and Technology Research Project/Program Management	3.88	A	37%	1.44	
Total Score					3.99
M&O Performance Goal	Numerical Score	Letter Grade	Weight	Weighted Score	Total Score
4.0 Leadership and Stewardship of the Laboratory	2.56	B-	20%	0.51	
5.0 Integrated Safety, Health, and Environmental Protection	3.14	B+	20%	0.63	
6.0 Business Systems	2.6	B-	20%	0.52	
7.0 Operating, Maintaining, and Renewing Facility and Infrastructure Portfolio	1.92	C	20%	0.38	
8.0 Integrated Safeguards and Security Management and Emergency Management Systems	3.22	B+	20%	0.64	
Total Score					2.68

Table B. FY 2006 Contractor Evaluation Score Calculation

Performance-Based Fee Earned:

Utilizing Table B, above, the scores for each of the Science and Technology (S&T) Goals and Management and Operations (M&O) Goals were multiplied by the weight assigned and these were summed to provide an overall score for each. The percentage of the available performance-based fee that was earned by the Contractor was determined based on the overall weighted score for the S&T Goals (see Table B.) and then compared to Table C. below. The overall numerical score of the M&O Goals from Table B. was then utilized to determine the final fee multiplier (see Table C.), which was utilized to determine the overall amount of performance-based fee earned for FY 2006 as calculated within Table D.



Overall Weighted Score from Table A.	Percent S&T Fee Earned	M&O Fee Multiplier
4.3	100%	100%
4.2		
4.1		
4.0	97%	100%
3.9		
3.8		
3.7	94%	100%
3.6		
3.5		
3.4	91%	100%
3.3		
3.2		
3.1		
3.0	88%	95%
2.9		
2.8		
2.7	85%	90%
2.6		
2.5		
2.4	75%	85%
2.3		
2.2		
2.1		
2.0	50%	75%
1.9		
1.8		
1.7	0%	60%
1.6		
1.5		
1.4		
1.3		
1.2		
1.1		
1.0 to 0.8	0%	0%
0.7 to 0.0	0%	0%

Table C. - Performance-Based Fee Earned Scale

Overall Fee Determination	
Percent S&T Fee Earned from Table C.	97%
M&O Fee Multiplier from Table C.	X 90%
Overall Earned Performance-Based Fee	87.3%

Table D. – Final Percentage of Performance-Based
Fee Earned Determination

Based on the overall performance within the S&T and M&O Goals the Contractor is awarded 87.3% of the available \$7.8M performance-based fee, which equates to an earned fee amount of \$6,809,400.00 for FY 2006.



II. PERFORMANCE GOALS, OBJECTIVES, AND MEASURES/TARGETS

1.0 Provide for Efficient and Effective Mission Accomplishment (Quality, Productivity, Leadership, & Timeliness of Research and Development)

The Contractor produces high-quality, original, and creative results that advance science and technology; demonstrates sustained scientific progress and impact; receives appropriate external recognition of accomplishments; and contributes to overall research and development goals of the Department and its customers.

The Provide for Efficient and Effective Mission Accomplishment Goal measured the overall effectiveness and performance of the Contractor in delivering science and technology results which contributed to and enhanced the DOE's mission of protecting our national and economic security by providing world-class scientific research capacity and advancing scientific knowledge by supporting world-class, peer-reviewed scientific results, which were recognized by others.

The Contractor has met and in most cases exceeded expectations as evidenced by the HQ Program Offices evaluations provided the Contractor an overall score of **4.1**, which corresponds to a letter grade of A+. Specific scores and evaluation data for the Performance Objectives indicated below are provided within the individual evaluations provided by each HQ Program Office or other customers (see appendices to this report). A short summary of Program Office evaluations are provided below:

- BER – The research program is a world leader in proteomics, atmospheric science and environmental molecular science – e.g., technology underlying the rapidly-expanding field within analytical chemistry known as proteomics, and at the same time has demonstrated the application of proteomics technology to problems in environmental science, genomics, and medicine.
- BES – Materials sciences research programs have demonstrated sustained leadership in the physics and chemistry of ceramic surfaces and in defects and defect processes. Chemical sciences (catalysis and experimental and theoretical condensed phase chemical physics) and geosciences research programs continue to demonstrate outstanding scientific progress and significant impact, with an appropriate level of productivity and effective delivery of S&T results.
- ASCR – Battelle exceeded expectations in research programs in which EMSL plays a key role: Battelle plays a leading role in simulation efforts in groundwater transport, computational biology and climate change making significant contributions to these efforts through use of the Molecular Science Computing Facility located within the EMSL. Battelle's efforts in the core mathematics and computational science research program have made significant contributions in these areas.
- DNN – The Contractor consistently does an outstanding job developing and maintaining a wide range of competencies of great importance to Defense Nuclear Nonproliferation. Overall, DNN has been satisfied with the amount and quality of the technical support but notes that the problems with the team's relationship to headquarters management has deteriorated over time, and bears close management scrutiny.
- DHS – The Contractor performed excellent work in support of the DHS S&T Detection and Surveillance R&D program, providing critical support for the Protein Pipeline project for detection of pathogens and toxins, RNA signature development for pathogen identification and viability determination, and proteomic characterization of biothreat agents.
- EM – Battelle provided research in the high level waste area is providing information regarding waste form acceptability, and expected long term performance. Also the Contractor provided technical leadership on the Hanford Groundwater Vadose Zone Integration Project, but could have been more proactive given their experience over the past 10 years. Battelle had some issues in meeting goals and milestones, but has put corrective action plans in place. It will be critical in the coming year to meet the EM commitments and still provide scientifically sound results.
- EERE – The Contractor and the DOE Joint Genome Institute released the first public sequence of *Aspergillus Niger*, which provides information that will accelerate progress toward meeting the Office of Biomass Program's goal to convert biomass to fuel ethanol economically. PNNL's leadership in catalysis has lead to significant advances in the field of diesel NOx adsorber technology and their outstanding synergy between basic and applied science can be seen within the Hydrogen, Fuel Cells and Infrastructure Technologies program.



- FE – Contractor has attracted world class scientists needed to ensure success of the SECA program and research in Advanced Fuel Cell Materials, Modeling and Simulation, and Fuel Processing was very relevant to Industry Teams.
- IN – The Contractor is a leader without peer in the counterintelligence realm. The CI office, manned by PNNL employees, has been singled out for its excellence by a demanding inspection program and is a benchmark against which the other CI offices gauge themselves.

Objectives:

- 1.1 Science and Technology Results Provide Meaningful Impact on the Field**
- 1.2 Provide Quality Leadership in Science and Technology**
- 1.3 Provide and sustain Science and Technology Outputs that Advance Program Objectives and Goals**
- 1.4 Provide for Effective Delivery of Science and Technology**

Science Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Advanced Scientific Computing Research					
1.1 Impact	A	3.8	40%	1.52	
1.2 Leadership	B+	3.2	30%	0.96	
1.3 Output	Pass	4.3	15%	0.65	
1.4 Delivery	Pass	4.3	15%	0.65	
Overall ASCR Total					3.78
Office of Basic Energy Sciences					
1.1 Impact	A	4.0	50%	2.0	
1.2 Leadership	A	3.9	20%	0.78	
1.3 Output	Pass	4.3	15%	0.65	
1.4 Delivery	Pass	4.3	15%	0.65	
Overall BES Total					4.08
Office of Biological and Environmental Research					
1.1 Impact	A-	3.7	30%	1.11	
1.2 Leadership	A-	3.7	20%	0.74	
1.3 Output	Pass	4.3	20%	0.86	
1.4 Delivery	Pass	4.3	30%	1.29	
Overall BER Total					4.0
Office of Fusion Energy Sciences					
1.1 Impact	A-	3.6	30%	1.08	
1.2 Leadership	A-	3.7	20%	0.74	
1.3 Output	Pass	4.3	30%	1.29	
1.4 Delivery	Pass	4.3	20%	0.86	
Overall FES Total					3.97
Office of Workforce Development for Teachers and Scientists					
1.1 Impact	A-	3.7	25%	0.93	
1.2 Leadership	A-	3.7	30%	1.11	
1.3 Output	Pass	4.3	30%	1.29	
1.4 Delivery	Pass	4.3	15%	0.65	
Overall WDTS Total					3.98

Table 1.1 – 1.0 SC Program Office Performance Goal Score Development



Science Program Office	Letter Grade	Numerical Score	Funding Weight (BA)	Weighted Score	Overall Weighted Score
Office of Advanced Scientific Computing Research	A	3.78	7.4%	0.28	
Office of Basic Energy Sciences	A+	4.08	14.2%	0.58	
Office of Biological and Environmental Research	A	4.0	76.5%	3.06	
Office of Fusion Energy Sciences	A	3.97	1.2%	0.05	
Office of Workforce Development for Teachers and Scientists	A	3.98	0.7%	0.03	
Performance Goal 1.0 Total					4.0

Table 1.2 – SC Program Office Overall Performance Goal Score Development

HQ Program Office ¹	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Defense Nuclear Nonproliferation					
1.1 Impact	A	4.0	25%	1.0	
1.2 Leadership	A	4.0	20%	0.8	
1.3 Output	Pass	4.3	30%	1.29	
1.4 Delivery	Pass	4.3	25%	1.08	
Overall DNN Total					4.17
Department of Homeland Security					
1.1 Impact	A	4.0	40%	1.6	
1.2 Leadership	A+	4.1	30%	1.23	
1.3 Output	Pass	4.3	0%	0	
1.4 Delivery	Pass	4.3	30%	1.29	
Overall DHS Total					4.12
Assistant Secretary for Energy Efficiency and Renewable Energy²					
1.1 Impact	--	--	30%	--	
1.2 Leadership	--	--	30%	--	
1.3 Output	--	--	20%	--	
1.4 Delivery	--	--	20%	--	
Overall EERE Total					3.99
Office of Intelligence					
1.1 Impact	A+	4.1	38%	1.56	
1.2 Leadership	A	4.0	38%	1.52	
1.3 Output ³	NA	NA	0%	NA	
1.4 Delivery	Pass	4.3	24%	1.03	
Overall IN Total					4.11

¹ Scores provided by HQ Program Offices for Objectives 1.3 and 1.4 were converted to Pass/Fail as appropriate and the corresponding numerical score was awarded per the FY 2006 PEMP.

² The EERE evaluation was provided at the Goal level only, no scores were provided at the Objective level.

³ IN did not provide an evaluation for Objective 1.3 therefore the 20% weighting assigned to 1.3 was proportionately redistributed amongst the other three Objectives.



Office of Fossil Energy⁴					
1.1 Impact	--	--	30%	--	
1.2 Leadership	--	--	30%	--	
1.3 Output	--	--	20%	--	
1.4 Delivery	--	--	20%	--	
Overall FE Total					4.13
Office of Environmental Management					
1.1 Impact	A-	3.7	50%	1.85	
1.2 Leadership	A-	3.7	20%	0.74	
1.3 Output	NA	NA	0%	NA	
1.4 Delivery	Pass	4.3	30%	1.29	
Overall EM Total					3.88

Table 1.3 – 1.0 Other Program Office & Customer Performance Goal Score Development

HQ Program Office	Letter Grade	Numerical Score	Funding Weight (BA)	Weighted Score	Overall Weighted Score
Office of Science	A	4.0	22%	0.88	
Office of Defense Nuclear Nonproliferation	A+	4.17	32%	1.33	
Department of Homeland Security	A+	4.12	22%	0.91	
Office of Energy Efficiency and Renewable Energy	A	3.99	6%	0.24	
Office of Intelligence	A+	4.11	2%	0.08	
Office of Fossil Energy	A+	4.13	3%	0.12	
Office of Environmental Management	A	3.88	13%	0.5	
Performance Goal 1.0 Total					4.06

Table 1.4 – Overall Performance Goal Score Development

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

Table 1.5 – 1.0 Goal Final Letter Grade

⁴ FE did not provide a rollup of program scores therefore overall FE scores at the Objective level were not available.



2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operations of Facilities

The Contractor provides effective and efficient strategic planning; fabrication, construction and/or operations of Laboratory facilities; and is responsive to the user community.

The Provide for Efficient and Effective Design, Fabrication, Construction and Operations of Research Facilities Goal measures the overall effectiveness and performance of the Contractor in planning for and delivering leading-edge specialty research and/or user facilities to ensure the required capabilities are present to meet today's and tomorrow's complex challenges. It also measured the Contractor's innovative operational and programmatic means for implementation of systems that ensures the availability, reliability, and efficiency of these facilities; and the appropriate balance between R&D and user support.

The Contractor has met and in many cases exceeded expectations as evidenced by the HQ Program Offices evaluations provided affording the Contractor an overall score of **4.0**, which translates to a letter grade of A. Specific scores and evaluation data for the Performance Objectives indicated below are provided within the SC evaluation provided (see Appendix 1). A short summary of Program Office evaluations are provided below:

- BER - Battelle has exceeded expectations with EMSL. The June 2006, BERAC-led "Follow-on Management and Operations Review of the EMSL" was highly complementary of the progress made by EMSL since the May 2005 review on the development and implementation of the management and operational procedures.
- BER – EMSL and PNNL management and staff are commended for the strong and effective response to the 2005 EMSL reviews; for their proactive and innovative management processes and for their collaborative and collegial approach to interactions with BER and PNSO.
- BER – The capital equipment refreshment planning workshops were successfully conducted by EMSL, and reports from the workshops were completed in a timely manner.
- BER – EMSL's targeted reintegration of Laboratory talent is noted and is expected to result in increased scientific productivity for both entities.
- BER – The Contractor has effectively utilized the ARM facility to support its research on clouds and aerosols and was given high marks in two recent reviews.

Objectives:

2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs

2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components

2.3 Provide Efficient and Effective Operation of Facilities

2.4 Utilization of Facility to Grow and Support Lab's Research Base and External User Community



HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Science					
2.1 Provide Effective Facility Design(s)	NA	NA	0%	NA	
2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components	NA	NA	0%	NA	
2.3 Provide Efficient and Effective Operation of Facilities	A	4.0	80%	3.2	
2.4 Utilization of Facility to Grow and Support Lab's Research Base and External User Community	A	4.0	20%	0.8	
Overall SC Total					4.0

Table 2.1 – 2.0 Program Office Performance Goal Score Development

HQ Program Office	Letter Grade	Numerical Score	Funding Weight (BA)	Weighted Score	Overall Weighted Score
Office of Science	A	4.0	100%	4.0	
Overall Program Office Total					4.0

Table 2.2 – Overall Performance Goal Score Development

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

Table 2.3 – 2.0 Goal Final Letter Grade



3.0 Provide Effective and Efficient Science and Technology Research Project/Program Management

The Contractor provides effective program vision and leadership; strategic planning and development of initiatives; recruits and retains a quality scientific workforce; and provides outstanding research processes, which improve research productivity.

The Provide Effective and Efficient Science and Technology Research Project/Program Management Goal measured the Contractor's overall leadership in executing S&T programs. Dimensions of program management covered included: 1) providing key competencies to support research programs to include key staffing requirements; 2) providing quality research plans that take into account technical risks and identify actions to mitigate risks; and 3) maintaining effective communications with customers to include providing quality responses to customer needs.

Battelle met and in many cases exceeded expectations as evidenced by the HQ Program Offices evaluations provided affording the Contractor an overall score of **3.88**, which translates to a letter grade of A. Specific scores and evaluation data for the Performance Objectives indicated below are provided within the individual evaluations provided by each HQ Program Office or other customers (see appendices to this report). A short summary of Program Office evaluations are provided below:

- BER – Battelle planning and management continues to set the standards in S&T technology research project/program management. In particular, the planning & management tools and documents that have been developed for EMSL have been important and impactful in achieving program objectives.
- BES – Materials sciences and chemical sciences research programs have demonstrated effective leadership and clear strategic planning. In the catalysis program the Laboratory has devoted significant effort and LDRD funding to building an internationally recognized focus area.
- ASCR – Battelle's contributions to the vision, planning and coordination of high performance computing is significant, though more so in Work for Others than for the Office of Science and it is not always reflective of the budget realities in the Office of Science. Communications and coordination with ASCR could be strengthened.
- DNN – Generally the Contractor demonstrates good leadership and management skills, and has provided critical project integration, technical, and management support to a number of programs in the Office of Defense Nuclear Nonproliferation.
- DHS – Overall performance in project/program management met or exceeded expectations and minor issues were either resolved and/or are being addressed. The Contractor is a professional organization, and to their credit, listens to their customers requirements and aggressively responds.
- EM – Battelle provided effective joint planning in the subsurface science area; however there is a concern over the ability to attract and retain qualified staff in the areas needed to address high level waste areas such as waste form performance, actinide chemistry, etc. Scientists provide EM with high quality scientific and technical expertise in areas of high level waste such as evaluation of low-temperature immobilization technologies and subsurface science; however, Battelle has not always been effective in leveraging research and expertise across the Laboratory in order to provide the best input for EM.
- EERE – Overall the Contractor met or exceeded expectations in project/program management. An example of this performance was the exceptional management of the Building Energy Codes Program under extremely adverse conditions maintaining continuity of the HQ programs during a congressionally mandated, time constrained rulemaking.
- FE – The arrangement among the Laboratory, Montana State University, and University of Florida in the HiTEC program is a good example of how the Contractor partners with others to enhance their core competencies. Throughout FE the Contractor has met or exceeded expectations in management of projects/programs and communications between Contractor staff and FE have been responsive and effective.
- IN – The Contractor shows excellent communication and customer service and is very responsive at all times. Across the spectrum of each of the discrete programs that the Laboratory manages for CI, PNNL has established a reputation for rapid response with quality information.



Objectives:

- 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision**
- 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management**
- 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs**

Science Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Advanced Scientific Computing Research					
3.1 Effective and Efficient Stewardship	A-	3.5	35%	1.23	
3.2 Project/Program Planning and Management	B+	3.4	35%	1.19	
3.3 Communications and Responsiveness	A-	3.5	30%	1.05	
Overall ASCR Total					3.47
Office of Basic Energy Sciences					
3.1 Effective and Efficient Stewardship	A	4.0	40%	1.6	
3.2 Project/Program Planning and Management	A	4.0	30%	1.2	
3.3 Communications and Responsiveness	A	4.0	30%	1.2	
Overall BES Total					4.0
Office of Biological and Environmental Research					
3.1 Effective and Efficient Stewardship	A-	3.7	20%	0.74	
3.2 Project/Program Planning and Management	A-	3.7	30%	1.11	
3.3 Communications and Responsiveness	A-	3.7	50%	1.85	
Overall BER Total					3.7
Office of Fusion Energy Sciences					
3.1 Effective and Efficient Stewardship	A-	3.7	40%	1.48	
3.2 Project/Program Planning and Management	A-	3.6	40%	1.44	
3.3 Communications and Responsiveness	A-	3.5	20%	0.7	
Overall FES Total					3.62
Office of Workforce Development for Teachers and Scientists					
3.1 Effective and Efficient Stewardship	A	3.9	20%	0.78	
3.2 Project/Program Planning and Management	A+	4.1	40%	1.64	
3.3 Communications and Responsiveness	A	4.0	40%	1.6	
Overall WDTs Total					4.02

Table 3.1 – 3.0 SC Program Office Performance Goal Score Development

Science Program Office	Letter Grade	Numerical Score	Funding Weight (BA)	Weighted Score	Overall Weighted Score
Office of Advanced Scientific Computing Research	A-	3.47	7.4%	0.26	
Office of Basic Energy Sciences	A	4.0	14.2%	0.57	
Office of Biological and Environmental Research	A-	3.7	76.5%	2.83	
Office of Fusion Energy Sciences	A-	3.62	1.2%	0.04	
Office of Workforce Development for Teachers and Scientists	A	4.02	0.7%	0.03	
Performance Goal 3.0 Total					3.73

Table 3.2 – SC Program Office Overall Performance Goal Score Development



HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Defense Nuclear Nonproliferation⁵					
3.1 Effective and Efficient Stewardship	A+	4.3	35%	1.51	
3.2 Project/Program Planning and Management	A	4.0	25%	1.0	
3.3 Communications and Responsiveness	A-	3.7	40%	1.48	
Overall DNN Total					3.99
Department of Homeland Security					
3.1 Effective and Efficient Stewardship	A	4.0	50%	2.0	
3.2 Project/Program Planning and Management	A	4.0	25%	1.0	
3.3 Communications and Responsiveness	A+	4.2	25%	1.05	
Overall DHS Total					4.05
Assistant Secretary for Energy Efficiency and Renewable Energy⁶					
3.1 Effective and Efficient Stewardship	--	--	25%	--	
3.2 Project/Program Planning and Management	--	--	25%	--	
3.3 Communications and Responsiveness	--	--	50%	--	
Overall EERE Total					3.99
Office of Intelligence					
3.1 Effective and Efficient Stewardship	A+	4.3	40%	1.72	
3.2 Project/Program Planning and Management	A	4.0	30%	1.2	
3.3 Communications and Responsiveness	A	4.0	30%	1.2	
Overall IN Total					4.12
Office of Fossil Energy⁷					
3.1 Effective and Efficient Stewardship	--	--	40%	--	
3.2 Project/Program Planning and Management	--	--	30%	--	
3.3 Communications and Responsiveness	--	--	30%	--	
Overall FE Total					4.08
Office of Environmental Management					
3.1 Effective and Efficient Stewardship	A-	3.7	30%	1.11	
3.2 Project/Program Planning and Management	B+	3.4	35%	1.19	
3.3 Communications and Responsiveness	B+	3.4	35%	1.19	
Overall EM Total					3.49

Table 3.3 – 3.0 Other Program Office & Customer Performance Goal Score Development

⁵ DNN did not provide an evaluation for Goal 3.0.

⁶ The EERE evaluation was provided at the Goal level only.

⁷ FE did not provide a rollup of program scores therefore overall FE scores at the Objective level were not available.



HQ Program Office	Letter Grade	Numerical Score	Funding Weight (BA)	Weighted Score	Overall Weighted Score
Office of Science	A-	3.73	22%	0.82	
Office of Defense Nuclear Nonproliferation	A	3.99	32%	1.28	
Department of Homeland Security	A+	4.05	22%	0.89	
Office of Energy Efficiency and Renewable Energy	A	3.99	6%	0.24	
Office of Intelligence	A+	4.12	2%	0.08	
Office of Fossil Energy	A+	4.08	3%	0.12	
Office of Environmental Management	A-	3.49	13%	0.45	
Performance Goal 3.0 Total					3.88

Table 3.4 – Overall Performance Goal Score Development

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

Table 3.5 – 3.0 Goal Final Letter Grade



4.0 Provide Sound and Competent Leadership and Stewardship of the Laboratory

The Contractor's Leadership provides effective and efficient direction in strategic planning to meet the mission and vision of the overall Laboratory; is accountable and responsive to specific issues and needs when required; and corporate office leadership provides appropriate levels of resources and support for the overall success of the Laboratory.

The Provide Sound and Competent Leadership and Stewardship of the Laboratory Goal measured the Contractor's Leadership capabilities in leading the direction of the overall Laboratory. It also measured the responsiveness of the Contractor to issues and opportunities for continuous improvement and corporate office involvement/commitment to the overall success of the Laboratory.

The Contractor met the expectations in enhancement of the Laboratory vision and linkage to the DOE missions. The strategy outlines planned outcomes and milestones for the partnerships, capability development, and program accomplishments required to deliver high value to each mission. The linkage between the Strategy and the business planning process continued to be strengthened and provides confidence that strategic goals will be realized. Both institutional and community partnerships are in place that will advance the Laboratory towards its strategic goals.

However, some of the other expectations within this goal were not met. The major areas of concern are related to the FY2006 results/progress associated with the Capability Replacement Laboratory (CRL) project, the Laboratory Assurance Process, and Business Process Improvement Project. Based on the overall performance of this Goal a score of **2.56 (B-)** has been awarded.

4.1 Provide a Distinctive Vision for the Laboratory and an Effective Plan for Accomplishment of the Vision to Include Strong Partnerships Required to Carry Out those Plans

The Contractor has met expectations within this Goal with no notable areas of increased or diminished performance identified resulting in a score of **3.1 (B+)** being awarded.

The Contractor has continued to evolve its strategic planning process over this performance period taking into account changes in Presidential Initiatives, the DOE and DHS strategic plans and 5 year program plans. The vision and mission outcomes and contributions outlined in the work plan present realistic, long range goals that are aligned with DOE long range priorities. The strategy outlines planned outcomes and milestones for the partnerships, capability development, and program accomplishments required to deliver high value to each mission. The linkage between the Strategy and the business planning process continues to be strengthened and provides confidence that strategic goals will be realized.

Partnerships are in place that should advance the Laboratory towards its strategic goals. These partnerships include both institutional and community partnerships such as the collaborative effort with Washington State University Tri-Cities (WSU-TC) that resulted in a start of construction for the Bioproducts, Science, and Engineering Laboratory on the WSU-TC campus. Other key institutional partnerships include the Institute for Interfacial Catalysis that added new national and international partners, including the Dalian Institute of Chemical Physics (China) and Australia's CSIRO; the partnership with the FutureGen Alliance where in a technical leadership and coordination role, and in partnership with General Electric and others, the Laboratory has been evaluating the technical advances required in gasification, separations, and hydrocarbon conversions to enable the first near-zero-emissions coal-to-liquids plant using domestic coal; several partnerships with Universities added to the National Visualization and Analytics Center (NVAC) lead by the Laboratory; and through two Memoranda of Understanding the Laboratory is building partnerships with two Chinese Academy of Science Institutes. In addition to maintaining a positive relationship with the local community the Contractor has established a solid foundation for support throughout the Pacific Northwest. Continuing efforts in math and science education program has been recognized on a regional and national scale. The long-term success of outreach and support for math and science education has



resulted in several regional and national initiations for Laboratory staff to speak on the process, implementation, and success of those programs.

4.2 Provide for Responsive and Accountable Leadership throughout the Organization

The Contractor met some expectations within this Objective; however, local Contractor leadership and corporate office support failed to meet expectations as it relates to the CRL. Based on the overall performance of this Objective a score of **2.0 (C)** has been awarded.

Senior leadership's use of accountability tools is mostly evident, timely, effective, and customer (DOE) oriented. However, with respect to the CRL, the Contractor's response to issues raised on the project were slow and often non responsive until directed by DOE. Battelle has struggled with the 300 Area strategy and the CRL project. This situation led to a very negative meeting with the Deputy Secretary.

The Battelle corporate assurance process is not meeting its intended purpose. The process implementation has not addressed the stipulations associated with the DOE conditional acceptance and there is little evidence that governance has strategically defined the success parameters and associated risk boundaries for the assurance process. While operational effectiveness is reasonably understood, progress in understanding the comprehensive management system, research, and business risks is insufficient to provide performance assurance.

In evaluating the external assessments/audits that had findings, only 20 percent of the findings were previously identified through the Laboratory internal assessments; this represents a performance level well below expectations.

4.3 Provide Efficient and Effective Corporate Office Support as Appropriate

Overall the Contractor met some expectations for this Objective; however, management engagement and communications regarding the CRL, innovative financing agreements, and the Business Process Improvement Project (BPIP) did not meet expectations. Based on this performance a score of **2.4 (C+)** is awarded.

Battelle has taken steps to leverage resources and identify opportunities to improve performance at the Laboratory and other co-managed laboratories. Integration workshops and meetings were held to establish a corporate-wide workforce planning strategy, enhance safety through human performance initiative, develop strategies for 10 CFR 851 implementation, and created Corporate forums for sharing best practices.

While leadership at Battelle seemed engaged in some key aspects of the CRL project and BPIP, the involvement was typically reactionary in lieu of systematic involvement through the corporate performance assurance process. Battelle did actively intervene late in the year on the CRL project, resulting in a major change in acquisition strategy to satisfy project constraints.



ELEMENT	Letter Grade	Numerical Score	Objective Weight	Total Points	Total Points
4.0 Effectiveness and Efficiency of Contractor Leadership and Stewardship					
4.1 Provide a Distinctive Vision for the Laboratory and an Effective Plan for Accomplishment of the Vision to Include Strong Partnerships Required to Carry Out those Plans	B+	3.1	40%	1.24	
4.2 Provide for Responsive and Accountable Leadership throughout the Organization	C	2.0	30%	0.6	
4.3 Provide Efficient and Effective Corporate Office Support as Appropriate	C+	2.4	30%	0.72	
Performance Goal 4.0 Total					2.56

Table 4.1 – 4.0 Goal Performance Rating Development

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

Table 4.2 – 4.0 Goal Final Letter Grade



5.0 Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health, and Environmental Protection

The Contractor sustains and enhances the effectiveness of integrated safety, health and environmental protection through a strong and well deployed system.

The Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health, and Environmental Protection Goal measured the Contractor's overall success in preventing worker injury and illness; implementation of ISM down through and across the organization; and providing effective and efficient waste management, minimization, and pollution prevention.

Overall the Contractor has met most of the expectations for this Goal with some notable areas of increased performance and one area that did not meet expectations as evidenced by the performance of the objectives described below. In summary, the Contractor continues to sustain excellence and enhance the effectiveness of Safety, Health, and Environmental Protection. Based on the overall performance, a score of **3.14 (B+)** is awarded.

5.1 Provide a Work Environment that Protects Workers and the Environment

Despite not meeting the FY 2006 target for TRC, the recordable case rate improved over last year's rate and the DART rate met the FY 2006 target and improved over last year. Much of this recent success can be tied to Battelle's focus on processes and systems that are increasingly getting better at tracking performance, performing self assessments and responding to the feedback provided to drive continuous improvement in safety performance through a maturing corrective action management system which tracks actions to completion.

The Contractor's stated goals of achieving best in class safety performance and a world class safety culture have credibility with an array of awards and continuous improvement accomplishments, a derivative of the maturing integrated safety management system (ISMS), integrated operations system (IOPS), and Voluntary Protection Program (VPP), acknowledged by DOE as a VPP "Superior" STAR site. An award by the trade magazine Occupational Hazards has recognized PNNL as one of the 12 best safety performing companies in 2006, and during FY 2006 the Laboratory was one of several businesses to be awarded a 2006 Better Workplace Awards for Safety by the Association of Washington Businesses.

As part of the Contractor's Safety Performance Improvement Plan (SPIP), managers are being provided with the tools and skills necessary to make them successful in leading Safety performance enhancements. Contractor managers participated in the DuPont Safety Management Leadership Workshop which included a practical safety observation module that could be added to Laboratory's current activity based self-assessment program. The continued implementation of the DuPont Leadership philosophy and application of human performance principals to day to day activities would appear to put the Contractor in position to succeed in meeting FY 2007 safety, health and environmental performance goals as done in FY 2006 earning a score of **3.1 (B+)**.

5.2 Provide Efficient and Effective Implementation of Integrated Safety, Health and Environment Management

Overall performance related to PEMP Objective 5.2 was positive in FY 2006. Significant progress has been made in development of an ISM measurement framework and particularly in development of a process to analyze data results and to provide credible conclusions for management decision. Improvements have also been made in line accountability for corrective actions as well as connection of corrective actions to the expected improvements in system performance. Noteworthy performance improvement actions have also been taken in the areas of safety leadership and focus on 24/7 safety resulting in improved performance. System performance continues to be validated by external entities through recognition under ISO 14001, EPA Performance Track, the DOE Voluntary Protection Program, and recently by the Occupational Hazards Magazine. Areas of concern related to ISM



system performance include documentation of safety related to offsite work, integration of safety into the CRL Project, implementation of the experimental authorization process, and the establishment of efficiency measures. While there are clear areas for improvement, these are generally offset by overall performance under this objective for a numeric grade of **3.2 (B+)**

5.3 Provide Efficient and Effective Waste Management, Minimization, and Pollution Prevention

The PNNL waste management, minimization and pollution prevention programs have been highly effective. Performance against baseline metrics has been sound and there were no regulatory notices of violations or corrections during FY 2006. In addition the Contractor has maintained ISO-14001 Registration, EPA Performance Track membership and received national recognition for pollution prevention activities. While the Contractor's approach is highly compliant, the management strategy to reduce costs and enhance efficiency has not been demonstrated. Limited progress was achieved in defining the systems and controls necessary for the Start-Clean Stay-Clean concept, Unneeded Chemicals and Materials disposition, and CRL future waste management needs. Performance for this objective has been rated at of **3.1 (B+)**.

ELEMENT	Letter Grade	Numerical Score	Objective Weight	Total Points	Total Points
5.0 Sustain Excellence and Enhance Effectiveness of Integrated Safety, Health, and Environmental Protection					
5.1 Provide a Work Environment that Protects Workers and the Environment	B+	3.1	40%	1.24	
5.2 Provide Efficient and Effective Implementation of Integrated Safety, Health and Environment Management	B+	3.2	40%	1.28	
5.3 Provide Efficient and Effective Waste Management, Minimization, and Pollution Prevention	B+	3.1	20%	0.62	
Performance Goal 5.0 Total					3.14

Table 5.1 – 5.0 Goal Performance Rating Development

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

Table 5.2 – 5.0 Goal Final Letter Grade



6.0 Deliver Efficient, Effective, and Responsive Business Systems and Resources that Enable the Successful Achievement of the Laboratory Mission(s)

The Contractor sustains and enhances core business systems that provide efficient and effective support to Laboratory programs and its mission(s).

The Provide Business Systems that Efficiently and Effectively Support the Overall Mission of the Laboratory Goal measured the Contractor's overall success in deploying, implementing, and improving integrated business system that efficiently and effectively support the mission(s) of the Laboratory.

Overall the Contractor has met or exceeded performance on two of the Objectives under this Goal and has mixed performance on the remaining three Objectives. Noteworthy progress in addressing areas of concerns from prior performance periods has been made and significant improvements have been made in the Financial and Acquisition Management Systems. Nonetheless additional improvements are still warranted and the overall level of performance in these systems has not yet achieved the expected level of performance. We are however very encouraged by the Contractor's efforts in strengthening and improving these management systems and are hopeful that these improvements will yield improved performance results in future performance periods. There is also a need to further institutionalize the Laboratory's Core Business Processes as well as formalize the measurement basis for it.

The Contractor's performance in the Human Resources and Intellectual Property management systems continues to be noteworthy. The Contractor is to be commended for the success that their diversity outreach initiatives have realized this year and the resulting increases in representation of women and minorities within the Laboratory that have resulted. In the area of Intellectual Property the Laboratory was recognized with four FLC awards and five R&D 100 awards. Based on the overall performance for this Goal, a score of **2.6 (B-)** is awarded.

6.1 Provide an Efficient, Effective, and Responsive Financial Management System(s)

Overall performance on this objective has been rated as **2.2 (C+)**. Battelle has fully complied with the DOE requirements for implementing the Office of Management and Budget (OMB) Circular A-123. Further, the Contractor made positive progress toward improving the financial management system through the Business Process Improvement Plan. While Battelle has completed a majority of the initial compensatory actions; a causal analysis and extent of conditions review identified a number of gaps where additional corrective actions are required. Additionally, new material audit findings and concerns were identified during the reporting period in the areas of labor charging, accruals, funds control, travel and relocation. The combinations of these deficiencies indicate issues in the design and/or operation of the Contractor's internal controls. These findings were significant enough to warrant OIG audits and were found to be relevant to the FY 2006 evaluation and fee determination.

Battelle responded to the findings in the Office of Inspector General (OIG) audit report on the FY 2004 Statement of Cost Incurred and Claimed (SCIC) developing and completing an action plan to address the OIG concerns. As a result the OIG signed the FY 2004 SCIC in June 2006. Battelle continued to struggle during FY 2006 in providing DOE with quality financial products that met expectations. For example, monthly performance reports lacked performance analysis, and the G&A construction rate, disclosure statement, and conference submittals lacked the required documentation and therefore were inadequate.

6.2 Provide an Efficient, Effective, and Responsive Acquisition and Property Management System(s)

Although improvements in both the acquisition and property management systems occurred during the reporting period some significant issues were identified that offset otherwise positive performance and if not corrected could have a negative impact in this area and/or the ability of the Laboratory to effectively accomplish its mission. Based on this evaluation a score of **2.4 (C+)** has been awarded.



The Contractor's acquisition and property management systems were generally effective in delivering needed goods and services on time and within cost during the evaluation period. Some improvements noted within these areas included the expansion of the B2B program, reducing the need for P-card transactions and the addition of new tools to the online tool boxes for both acquisition and property management, reducing risks within the procurement and property systems. In addition, Battelle exceeded 5 of 6 small business goals. Performance in the area of effective competition (amount of competitive bids versus sole source procurements) continues to be slightly below expectations.

Audits conducted on the Silicon Graphics Incorporated (SGI) subcontract and the International Nuclear Safety Program (INSP) identified findings severe enough to warrant action by the IG. The SGI investigation determined Battelle had awarded a subcontract, in part, because SGI proposed to fund a separate private contract for Battelle research related to the Supercomputer procurement (a possible violation of the Anti-Kickback clause of the contract) while the INSP review determined Battelle had provided unallowable compensation for personal items to former Ukrainian Specialists. Furthermore, the failure to adequately correct the procurement and receiving process issues associated with the Type B accident indicate the internal system controls are not meeting expectations.

6.3 Provide an Efficient, Effective, and Responsive Human Resources Management System

Overall the Contractor performed well in all aspects of Human Resources Management throughout the evaluation period meeting or exceeding expectations resulting in a score of 3.4 (B+) being awarded. The Contractor's performance in the area of diversity was particularly noteworthy. Examples of this performance was in the significant improvements in the representation of women and minorities within the Laboratory, as well as the further development of key partnerships with the National Consortium for Graduate Degrees for Minorities in Engineering and Sciences - (GEM) and the University of New Mexico. Both these partnerships are helping the Contractor in further increasing the diversity at the Laboratory.

6.4 Provide Efficient, Effective, and Responsive Management Systems for Internal Audit and Oversight; Quality; Information Management; and Other Administrative Support Services as Appropriate

Performance under this Objective has been rated at 2.2 (C+). The Contractor continues to have weakness in adequately defining, integrating and evaluating some of the Laboratory management system processes. The continued high reliance on an "expert-based" approach to understanding core business process(es) performance, precludes the ability to systematically understand the value and impact associated with the supporting and enabling systems. An additional area of weakness includes the tools and mechanisms necessary to demonstrate system effectiveness, efficiency and results against the Laboratory strategic plan. While the Contractor has worked toward addressing these concerns over the past several years, progress this past year in clarifying and strengthening individual accountabilities has begun to reflect some limited improvement late in the performance period. Although the progress toward institutionalization of the Laboratory's core processes is overstated in the Contractor's self evaluation, the description of the challenges and next steps appear appropriate to begin addressing the concerns.

Notable performance during the evaluation period included performance measurement and corrective action management process improvements. The limited progress toward reducing the carry-over of planned internal audits did not meet expectations.

6.5 Demonstrate Effective Transfer of Technology and Commercialization of Intellectual Assets

Battelle has continued to enhance the Technology Commercialization at the Laboratory and has exceeded expectations in this area. Total consideration (total of license revenue and non-cash returns from licensing of all Laboratory derived IP, as well as new R&D project sales where IP is optioned,



licensed or otherwise used) was at \$33.5M for FY 2006 exceeding expectations by \$13.5M. Growth in the area of net royalties has allowed the Laboratory to provide additional Use at Facility Funds that can be used for new commercial developments. Based on the overall performance of this Objective a score of 3.4 (B+) has been awarded.

ELEMENT	Letter Grade	Numerical Score	Objective Weight	Total Points	Total Points
6.0 Deliver Efficient, Effective, and Responsive Business Systems and Resources that Enable the Successful Achievement of the Laboratory Mission(s)					
6.1 Provide an Efficient, Effective, and Responsive Financial Management System(s)	C+	2.2	30%	0.66	
6.2 Provide an Efficient, Effective, and Responsive Acquisition and Property Management System(s)	C+	2.4	20%	0.48	
6.3 Provide an Efficient, Effective, and Responsive Human Resources Management System	B+	3.4	20%	0.68	
6.4 Provide Efficient, Effective, and Responsive Management Systems for Internal Audit and Oversight; Quality; Information Management; and Other Administrative Support Services as Appropriate	C+	2.2	20%	0.44	
6.5 Demonstrate Effective Transfer of Technology and Commercialization of Intellectual Assets	B+	3.4	10%	0.34	
Performance Goal 6.0 Total					2.6

Table 6.1 – 6.0 Goal Performance Rating Development

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

Table 6.2 – 6.0 Goal Final Letter Grade



7.0 Sustain Excellence in Operating, Maintaining, and Renewing the Facility and Infrastructure Portfolio to Meet Laboratory Needs

The Contractor provides appropriate planning for, construction and management of Laboratory facilities and infrastructures required to efficiently and effectively carry out current and future S&T programs.

The Sustain Excellence in Operating, Maintaining, and Renewing the Facility and Infrastructure Portfolio to Meet Laboratory Needs Goal measured the overall effectiveness and performance of the Contractor in planning, acquisition, operations and divesture of Laboratory facilities and infrastructure to ensure space is available to meet today and tomorrow's S&T program needs.

The Contractor met some expectations within this goal; however issues associated with the Physical Science Facility (PSF) and Alternative Financing portions of the Capability Replacement Laboratory (CRL) were significant, resulting in changing the CRL project acquisition strategy. Based on the overall performance a score of **1.92 (C)** is awarded.

7.1 Manage Facilities and Infrastructure in an Efficient and Effective Manner that Optimizes Usage and Minimizes Life Cycle Costs

The overall performance of this Objective met DOE expectations during the evaluation period resulting in a score of **3.3 (B+)** being awarded. The Contractor has provided appropriate planning and management of existing Laboratory facilities and infrastructures to efficiently and effectively carry out current Laboratory S&T projects. The high facility reliability, energy efficiency and operational effectiveness served to enhance the Laboratory's ability to conduct its mission without undue interruption or delays.

7.2 Provide Planning for and Acquire the Facilities and Infrastructure Required to support Future Laboratory Programs

Most of the performance expectations set by the measures and targets were not met and a number of other major deficiencies were identified that adversely impacted progress in the acquisition of facilities and infrastructure required for continuing Laboratory programs. Successes were limited to timely submittal of the FY 2006 Ten Year Site Plan, and improvements in small project management discipline.

Most key aspects associated with the planning, acquisition and execution on the Capability Replacement Laboratory project failed to be successful, increasing the overall risks to future Laboratory mission accomplishment. The Contractor's failure to adequately integrate safety into the conceptual design at CD-1 resulted in significant rework and invalidated the acquisition strategy ability to achieve the mission need within the cost and schedule objectives. Additionally, the CRL/PSF technical, cost, schedule and management review (Lehman Review, January, 2006) noted substantial technical and management deficiencies with the CRL project. These deficiencies resulted in a schedule delay for the planned CD-2 date and the failure to obtain approval of the Alternative Financing Business Case during this evaluation period. Progress was made toward gaining an understanding of the equipment and material relocation requirements, however, without an approved project baseline the identification of potential schedule conflicts with the River Corridor Cleanup Contract was not accomplished. A numeric score of **1.0 (D)** has been assigned to this Objective.



ELEMENT	Letter Grade	Numerical Score	Objective Weight	Total Points	Total Points
7.0 Sustain Excellence in Operating, Maintaining, and Renewing the Facility and Infrastructure Portfolio to Meet Laboratory Needs					
7.1 Manage Facilities and Infrastructure in an Efficient and Effective Manner that Optimizes Usage and Minimizes Life Cycle Costs	B+	3.3	40%	1.32	
7.2 Provide Planning for and Acquire the Facilities and Infrastructure Required to support Future Laboratory Programs	D	1.0	60%	0.6	
Performance Goal 7.0 Total					1.92

Table 7.1 – 7.0 Goal Performance Rating Development

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

Table 7.2 – 7.0 Goal Final Letter Grade



8.0 Sustain and Enhance the Effectiveness of Integrated Safeguards and Security Management (ISSM) and Emergency Management Systems

The Contractor sustains and enhances the effectiveness of integrated safeguards and security and emergency management through a strong and well deployed system.

The Sustain and Enhance the Effectiveness of Integrated Safeguards and Security Management (ISSM) and Emergency Management Systems Goal measured the Contractor's overall success in safeguarding and securing Laboratory assets that supports the mission(s) of the Laboratory in an efficient and effective manner and provides an effective emergency management program.

Overall the Contractor has met expectations for this Goal with no notable areas of increased or diminished performance, which is evidenced by the performance of each of the objectives below. Summarily, the Contractor continues to sustain and enhance the effectiveness of ISSM and Emergency Management Systems by providing value added, performance-based and compliant programs. Based on the overall performance, a score of **3.22 (B+)** is awarded.

8.1 Provide an Efficient and Effective Emergency Management System

The Contractor has maintained an efficient and effective emergency management program which has been validated during the year by performing 62 building emergency preparedness drills on selected facilities. Lessons learned were identified for incorporation into future drills, training modules and building emergency procedures. Personnel that participate in drills are well trained, and their performance met expectations. The Contractor has maintained an employee and management awareness of emergency responsibilities by performing 12 facility emergency preparedness verification walkthroughs. The Contractor has demonstrated progress toward developing and implementing a new (and compliant) emergency management/preparedness system that supports the current and future needs of the Laboratory. Based on this performance, a score of **3.1 (B+)** is awarded.

8.2 Provide an Efficient and Effective System for Cyber-Security

Significant progress in configuration management and patch management has reduced the Contractor's vulnerability to attacks. The Contractor continues to deploy a defense in depth strategy to detect and neutralize attacks as they occur and limit their impact. An effective, efficient and compliant cyber security program continues to be demonstrated through successful surveys and positive corrective action management. Improvement areas noted through an Office of Science Site Assistance Visit are being addressed and will strengthen the Contractor's overall cyber security program. As a result of the Contractor's defense in depth strategy, only five reportable incidents occurred during this fiscal year with minimal to no damage. The total score (impact and causal factors) for the year was well within the target. The positive score reflects a strong cyber security program protecting against potential and reportable compromises and assuring information is appropriately protected. Based on this performance, a score of **3.1 (B+)** is awarded.

8.3 Provide an Efficient and Effective System for the Protection of Special Nuclear Materials, Classified Matter, and Property

The Contractor continues to demonstrate an efficient and effective protection program through successful surveys, positive corrective action management and continuous improvement initiatives. The periodic security survey of the Marine Research Operations (Sequim) conducted in August, resulted in a satisfactory rating with no findings. Previous security surveys of the Laboratory and its facilities also resulted in satisfactory ratings with no repeat findings identified. Corrective actions to identified findings were implemented in accordance with approved plans during this performance period. The Contractor successfully reviewed its nuclear material inventories and identified those nuclear material items necessary for the long-term support of programmatically approved research capabilities and those nuclear material items no longer needed. Also, processes and procedures have been developed to ensure that new material coming into the Laboratory requires a statement of



stewardship and responsibility from the funding client and the material is assigned a project number reflecting that programmatic ownership. Based on this performance, a score of 3.3 (B+) is awarded.

8.4 Provide an Efficient and Effective System for the Protection of Classified and Sensitive Information

Classified and sensitive information assets are appropriately protected as demonstrated through a proactive incident reporting, tracking and inquiry process and an effective Security Education and Awareness program, both of which continue to foster a healthy security culture at the Laboratory. At years end, 99% of staff and management completed required Security Education and Awareness training. All incidents of security concern were reported within the required timeframes. More than 50% of these incidents are self reported (with no witnesses) demonstrating the proactive security culture at the Laboratory. The Office of Independent Oversight's inspection of the Classification and Information Control Program was conducted during FY 2006. The program was found to be satisfactory with only few minor findings identified. The security survey of the Marine Science Operations (Sequim) also occurred and resulted in no findings and a satisfactory program rating. Previous security surveys of the Laboratory and its facilities also resulted in an overall satisfactory rating with no repeat findings identified. All findings associated with the pervious security surveys were corrected and validated as closed during this performance period. Approval was received for the first classified network within the Office of Science supporting the Department's goal to reduce the amount of Accountable Classified Removable Media (ACREM) by 2008. Through this effort, the Contractor completed the transfer of 20 systems on to the classified network resulting in a commensurate and measurable reduction in ACREM. Based on this performance, a score of 3.3 (B+) is awarded.

ELEMENT	Letter Grade	Numerical Score	Objective Weight	Total Points	Total Points
8.0 Sustain and Enhance the Effectiveness of Integrated Safeguards and Security Management (ISSM)					
8.1 Provide an Efficient and Effective Emergency Management System	B+	3.1	25%	0.78	
8.2 Provide an Efficient and Effective System for Cyber-Security	B+	3.1	25%	0.78	
8.3 Provide an Efficient and Effective System for the Protection of Special Nuclear Materials, Classified Matter, and Property	B+	3.3	25%	0.83	
8.4 Provide an Efficient and Effective System for the Protection of Classified and Sensitive Information	B+	3.3	25%	0.83	
Performance Goal 8.0 Total					3.22

Table 8.1 – 8.0 Goal Performance Rating Development

Total Score	4.3-4.1	4.0-3.8	3.7-3.5	3.4-3.1	3.0-2.8	2.7-2.5	2.4-2.1	2.0-1.8	1.7-1.1	1.0-0.8	0.7-0
Final Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

Table 8.2 – 8.0 Goal Final Letter Grade



APPENDIX 1

Office of Science

ASCR Laboratory Appraisal Summary
Pacific Northwest National Laboratory (PNNL)

Mission Accomplishment

PNNL plays a leading role in simulation efforts in groundwater transport, computational biology and climate change making significant contributions to these efforts. PNNL also have significant efforts in the multiscale mathematics that are critical to simulations in these areas. PNNL lead a SciDAC project in computational biology and participate in many other SciDAC efforts. PNNL also have related efforts in the core mathematics and computational science core research program and have made significant contributions in these areas. PNNL researchers are invited to give talks at the SciDAC annual meeting and other significant conferences related to computational science. PNNL researchers make important contributions to computational science and related publications.

Science Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Advanced Scientific Computing Research					
1.1 Impact	A	3.8	40%	1.52	
1.2 Leadership	B+	3.2	30%	0.96	
1.3 Output	Pass	4.3	15%	0.65	
1.4 Delivery	Pass	4.3	15%	0.65	
Overall ASCR Total					3.78

Facilities

PNNL does not host ASCR Facilities.

Program Management

PNNL plays a key role in BER simulation efforts. The contributions of PNNL to the vision, planning and coordination of these efforts and the underlying mathematics are significant. PNNL contributions to the vision, planning and coordination of high performance computing is also significant though more so in PNNL's Work for Others than for the Office of Science and not always reflective of budget realities in the Office of Science. Communications and coordination with ASCR could be strengthened.

Science Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Advanced Scientific Computing Research					
3.1 Effective and Efficient Stewardship	A-	3.5	35%	1.23	
3.2 Project/Program Planning and Management	B+	3.4	35%	1.19	
3.3 Communications and Responsiveness	A-	3.5	30%	1.05	
Overall ASCR Total					3.47

BES Laboratory S&T Evaluation Worksheets

SC Laboratory: Pacific Northwest National Laboratory (PNNL)

Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

The Contractor produces high-quality, original, and creative results that advance science and technology; demonstrates sustained scientific progress and impact; receives appropriate external recognition of accomplishments; and contributes to overall research and development goals of the Department and its customers.

Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field

BES \$ Wt Score/Grade: 4.0 / A

The program supported by Materials and Engineering Physics was last reviewed in FY 2005. The review was generally favorable. The program was found to be of very high quality and innovative. There were some concerns about one subtask within the Chemistry and Physics of Ceramics Surfaces project and the overall coherence of the Molecular Organized Nanostructured Materials project; PNNL responded appropriately and in a timely manner to the action items called for by the BES guidance letter.

The multi-principal investigator catalysis program at PNNL was site-reviewed in FY 2006 by eight, external, senior technical experts. Their assessments of the quality and productivity of this effort were overwhelmingly positive. In addition, three elements of the geosciences program were mail-reviewed and also reviewed very strongly. In each area, both internal and external collaborations were praised by reviewers. A Chemical Imaging proposal was rated highly by mail review and funded.

The experimental and theoretical programs in condensed phase chemical physics, which were not reviewed in FY 2006, continue to demonstrate excellent scientific progress.

Objective 1.2 Provide Quality Leadership in Science and Technology

BES \$ Wt Score/Grade: 3.9 / A

The research activities supported at PNNL by the BES Materials Sciences and Engineering Division that are deemed of extremely high quality are those in defects and defect processes in ceramics and in ceramic surfaces research.

Principal investigators in the catalysis and geosciences programs are nationally and internationally recognized. The critical mass of scientists and capabilities has attracted several important hires and led to numerous involvements in major conferences. Similarly, the chemical physics program contains a number of world-leading investigators.

Objective 1.3 Provide and sustain Science and Technology Outputs that Advance Program Objectives and Goals

BES \$ Wt Score/Grade: 4.3 / Pass

The research supported by the BES Materials Sciences and Engineering Division at PNNL produces high quality publications in prestigious journals in the areas of defect processes in ceramics, molecular nanostructures, and ceramic surfaces and interfaces.

Objective 1.4 Provide for Effective Delivery of Science and Technology

BES \$ Wt Score/Grade: 4.3 / Pass

The activities supported by the Materials Sciences and Engineering Division have been effective in transmitting the results to the community. PNNL management for the materials research program has been very responsive to BES requests for the delivery of scientific results.

Goal 2.0 Provide for Efficient and Effective Design, Fabrication, Construction and Operations of Research Facilities

The Contractor provides effective and efficient strategic planning; fabrication, construction and/or operations of Laboratory research facilities; and is responsive to the user community.

Objectives 2.1-2.4

Not applicable; BES has no major research facilities at PNNL.

Goal 3.0 Provide Effective and Efficient Science and Technology Program Management

The Contractor provides effective program vision and leadership; strategic planning and development of initiatives; recruits and retains a quality scientific workforce; and provides outstanding research processes, which improve research productivity.

Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

BES \$ Wt Score/Grade: 4.0 / A

PNNL is a recognized leader in defect processes in ceramics and in molecular nanostructures according to the most recent review. The laboratory has continued to be successful in attracting scientists with stellar international reputations.

In the catalysis program, the laboratory leadership has devoted significant effort and LDRD funding to building an internationally recognized focus area. Their Institute for Interfacial Catalysis, which includes BES-funded as well as Work-for-Others-funded activities, has attracted several world-class principal investigators to the overall program. Laboratory management has shown excellent judgment in the management of the chemical physics program,

taking advantage of some staff attrition to make strategic new hires that promote the core strengths of the program.

Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management

BES \$ Wt Score/Grade: 4.0 / A

BES research carried out at PNNL in defect processes in ceramics and in the chemistry and physics of ceramic surfaces strongly supports the scientific mission needs of the Department and the Nation. The work is well planned and shows a close coupling between the BES Materials and Engineering Physics program and the Department's technology programs at PNNL, including those of the Offices of Energy Efficiency and Renewable Energy, Fusion Energy Sciences, and Environmental Management. PNNL has been actively engaging in BES workshop planning activities, including the recent Solid-State Lighting and Advanced Nuclear Energy Systems workshops.

Strategic planning, coordination across programs (e.g., chemical physics and catalysis), and implementation in the chemical sciences has been excellent.

Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

BES \$ Wt Score/Grade: 4.0 / A

Dr. Gregory J. Exarhos is performing very well in his role of coordinator for the Materials Sciences and Engineering Division program at PNNL, particularly with respect to his detailed attention to program reviews. He has been very responsive to BES comments and directions provided in the guidance letter.

Managers and scientists in the Chemistry Division interact frequently and appropriately with program managers in BES, and the laboratory prepares annual summary presentations and program booklets that keep BES well informed of research progress in all programs.

Fiscal Year 2006	BER
Pacific Northwest National Laboratory	Justification
Goal #1 Mission Accomplishment	
Objectives	
1.1 Impact	<p>Two Life Sciences programs of demonstrable excellence at PNNL are the proteomics program headed by Dick Smith, and the Shewanella Federation program led by Jim Frederickson. The scientific program in proteomics/mass spectrometry directed by Richard D. Smith continues to produce new scientific advances with high impact. The research program has become a world leader in the technology underlying the rapidly-expanding field within analytical chemistry known as proteomics, and at the same time has demonstrated the application of proteomics technology to problems in environmental science, genomics, and medicine. Dr Smith has attracted substantial funding from the National Institutes of Health, building upon the Office of Science support for his core research program to develop new capabilities for medical research.</p> <p>The Shewanella Federation GTL proposal was renewed for \$4.6M. The reviews were outstanding and can be summarized by one reviewer's comments, "This proposal describes an impressive and ambitious effort to provide an integrated understanding of Shewanella oneidensis MR-1 and related species. The approach is unusual if not unprecedented in scope and in the number of laboratories involved in the effort."</p> <p>The PNNL group provides leadership in science supporting understanding of subsurface contaminant fate and transport, including noteworthy publications in PLoS (role of microbes in reducing hexavalent uranium); and PNAS (electrically conductive bacterial nanowires). These publications document PNNL's impact to advance our understanding of the role of bacteria in controlling contaminant mobility in the subsurface.</p> <p>PNNL is a recognized leader in aerosol and cloud research and in integrated assessment research. It is also a successful steward of mission-relevant research on aerosols and clouds and their effects on radiation. PNNL scientists played major roles in drafting two Synthesis and Assessment Reports for the U.S. Climate Change Science Program. The ARM TWP Site Scientist team from PNNL played a leading role in leveraging DOE's investment of ~\$3 million in an IOP at the Darwin site to build a \$10M international IOP that was conducted in 2006 at the site. Initial findings indicate that this</p>

	experiment will significantly change the representation in climate models of convective systems in the tropics. A new aerosol indirect effect parameterization scheme was developed by a PNNL scientist for the Community Atmospheric Model (CAM).
1.2 Leadership	<p>Jim Frederickson has undertaken a leadership role in GTL and has been appointed GTL Chief Scientist.</p> <p>PNNL scientists continue to provide scientific leadership in a wide variety of areas including subsurface biogeochemistry, environmental microbiology and molecular microbiology. PI's are highly visible in both the scientific and applied communities.</p> <p>PNNL staff member Steven Ghan has been appointed an editor of the journal JGR-Atmospheres. PNNL staff [<i>Fast</i>] played a key integrating role in the interagency MILAGRO field campaign, providing model-based experimental design coordination for maximum integration of field measurements and subsequent regional model analyses by PNNL and other research groups in the campaign. PNNL staff members [<i>Berkowitz, Ghan</i>] were designated lead scientist for each of two upcoming DOE field campaigns, and are effectively exercising leadership and coordination roles in preparation for these campaigns. PNNL is a strong research performer in aerosol and cloud research but more is needed from the performers to become recognized leaders in the community. PNNL scientists served a key leadership role in drafting Synthesis and Assessment Products (SAPs) for the U.S. Climate Change Science Program.</p>
1.3 Output (productivity)	Pass - Output is excellent for the investment.
1.4 Delivery	Pass – PI's are well integrated throughout the ERSD program providing support to the program in general as well as to specific funded projects. PNNL scientists are commended for their integration with the Office of Environmental Management (EM). PNNL continues to work closely with EM to translate basic scientific advances into management tools for the cleanup effort.
Goal #2 Design, Fabrication, Construction and Operation of Facilities	
Objectives	
2.1 Design of Facility	
2.2 Construction of Facility/Fabrication of Components	

2.3 Operation of Facility	<p>The June 2006, BERAC-led "Follow-on Management and Operations Review of the EMSL" was highly complementary of the management and operational procedures progress made by EMSL since the May 2005 review. Since the June 2006 review, EMSL management and staff have continued to institute the EMSL Implementation Plan and to use the EMSL Dashboard as a productive management tool (and recognized "Best Practice"). The capital equipment refreshment planning workshops were successfully conducted and reports from the workshops completed in a timely manner. EMSL and PNNL management and staff are commended for the strong and effective response to the 2005 EMSL reviews; for their proactive and innovative management processes and for their collaborative and collegial approach to interactions with BER and PNSO.</p> <p>PNNL plays a strong role as a partner in the DOE Joint Genome Institute user facility, contributing to capabilities in genome sequence finishing, metagenomic annotation and analysis</p> <p>The ARM Facility was given high marks in two recent reviews. Jimmy Voyles, the Technical Manager, has provided outstanding leadership for the facility. Under his leadership, engineering support for existing and new instruments has been maintained at a high level, which resulted in the ARM Facility's meeting and exceeding all the PART metrics for 2006.</p>
2.4 Utilization of Facility to Grow and Support Lab's Research Base	<p>EMSL's targeted reintegration of PNNL scientific talent is noted and is expected to result in increased scientific productivity for both entities.</p> <p>PNNL has effectively utilized the ARM facility to support its research on clouds and aerosols.</p>
Goal #3 Program Management	
Objectives	
3.1 Stewardship of Scientific Capabilities and Programmatic Vision	<p>PNNL has done a good job of developing, maintaining and managing scientific talent and capabilities in the environmental area.</p> <p>PNNL has done an effective job of stewardship of its scientific capabilities in aerosol and cloud research.</p>
3.2 Program Planning and Management	<p>PNNL planning and management continues to set the standard in the area of environmental sciences. EMSL in particular has developed important and impactfull planning tools and documents.</p> <p>Management of the PNNL Atmospheric Science & Global Change</p>

	Division has been notably supportive of current and projected SC/BER program needs as demonstrated in strategic hiring and program development, deployment of LDRD resources, and responsiveness to BER program priorities. Articulation of a coherent scientific vision of PNNL's climate research and how to better integrate its two existing core capabilities - atmospheric research and integrated assessment research - with other climate change research program areas is needed.
3.3 Program Management-Communication & Responsiveness (to HQ)	PNNL communications are of high quality, appropriate timing and developed to provide the necessary information to BER management and staff. Harvey Bolton and Charlotte Geffen are effective and proactive in representing PNNL's environmental science program to BER and vice versa. PNNL's responsiveness to requests for information from HQ are timely and of high quality.

Science Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Biological and Environmental Research					
1.1 Impact	A-	3.7	30%	1.11	
1.2 Leadership	A-	3.7	20%	0.74	
1.3 Output	Pass	4.3	20%	0.86	
1.4 Delivery	Pass	4.3	30%	1.29	
Overall BER Total					4.0

HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Science					
2.1 Provide Effective Facility Design(s)	NA	NA	0%	NA	
2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components	NA	NA	0%	NA	
2.3 Provide Efficient and Effective Operation of Facilities	A	4.0	80%	3.2	
2.4 Utilization of Facility to Grow and Support Lab's Research Base and External User Community	A	4.0	20%	0.8	
Overall SC Total					4.0

Science Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Biological and Environmental Research					
3.1 Effective and Efficient Stewardship	A-	3.7	20%	0.74	
3.2 Project/Program Planning and Management	A-	3.7	30%	1.11	
3.3 Communications and Responsiveness	A-	3.7	50%	1.85	
Overall BER Total					3.7

FES NARRATIVE ASSESSMENT OF SCIENCE AND TECHNOLOGY AT PACIFIC NORTHWEST NATIONAL LABORATORY

Objective 1.1 Science and Technology Results Provide Meaningful Impact on the Field

Rating: 4

Assessment: The quality of PNNL work on fusion materials research continues to be outstanding. PNNL has made important contributions to the domestic and international efforts on modeling of irradiation damage and helium effects, on issues of ceramic composites (focusing on silicon carbide fibers in a silicon carbide matrix), on body-centered cubic metals (focusing on vanadium alloys and ferritic steels), and on face-centered cubic metals (copper alloys, austenitic steels, and Ni-based alloys). In the area of silicon carbide composites research, PNNL continues to be the lead U.S. lab and has made numerous contributions to addressing the critical feasibility issues in the use of these materials in a fusion environment.

Objective 1.2 Provide Quality Leadership in Science and Technology

Rating: 4.1

Assessment: Dr. Kurtz, the principal investigator, has provided strong leadership in several areas of fusion materials research domestically and internationally, and has taken leadership of the vanadium alloy research task under a U.S.-Japan collaboration. Dr. Kurtz also made important contributions to collaborative research on fusion materials under the IEA as well as providing his technical expertise on the U.S. effort to design and build a test blanket for ITER. PNNL continues to be a strong leader in the miniaturization of irradiation specimens, which has yielded greatly increased productivity from irradiation testing of fusion materials.

Objective 1.3 Provide and sustain Science and Technology Outputs that Advance Program Objectives and Goals

Rating: Pass

Assessment: The PNNL research staff is very well respected in both the domestic and international communities and has produced numerous peer-reviewed publications in key areas of fusion materials research. PNNL's original and creative scientific output has advanced the science of fusion materials and has shown sustained progress and impact in the field. The PNNL staff is held in very high regard by the scientific community and they submitted a number of papers for the December 2005 International Conference of Fusion Reactor Materials which is the premier fusion materials conference held every two years.

Objective 1.4 Provide for Effective Delivery of Science and Technology

Rating: Pass

Assessment: PNNL has done an excellent job of meeting all of its milestones and in transmitting their results to the fusion and materials communities.

Objective 2.1 Provide Effective Facility Design(s) as Required to Support Laboratory Programs (i.e., activities leaving up to CD-2)

Assessment: N/A

Objective 2.2 Provide for the Effective and Efficient Construction of Facilities and/or Fabrication of Components (execution phase, Post CD-2 to CD-4)

Assessment: N/A

Objective 2.3 Provide Efficient and Effective Operation of Facilities

Assessment: N/A

Objective 2.4 Utilization of Facility to Grow and Support Lab's Research Base and External User Community

Assessment: N/A

Objective 3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Rating: 4.1

Assessment: PNNL continues to focus its efforts on the most important tasks of the materials program: material issues with the ITER device, the ITER test blanket program, U.S. participation in international collaborations of a bilateral nature (mainly, with JAEA and MEXT in Japan) and of a multinational nature (mainly, with Europe, Japan, and the Russian Federation under the IEA Implementing Agreement on Fusion Materials). Dr Kurtz has also recently taken over the leadership of the fusion materials steering committee which is responsible for providing guidance and coordination in the fusion materials community.

Objective 3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management

Rating: 4.1

Assessment: PNNL leads the Fusion Materials Sciences Program effort on silicon carbide composite research and manages key elements of the two U.S.-Japan collaborations on fusion materials. They continue to play an important role in the theory and modeling of materials behavior and integration of the theory and modeling with the experimental programs. PNNL, on behalf of the fusion materials community, continues to support this year the fusion plasma chamber community in their effort to design and build an ITER test blanket. They continue to perform in an outstanding manner in these roles. They also shared leadership with ORNL and others in the fusion materials community in developing plans for redirection that have put greater emphasis on the resolution of nearer term material issues that are necessary in order to support the potential U.S. contributions to the ITER device.

Objective 3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

Rating: 4

Assessment: PNNL is highly responsive to DOE and to fusion community input in setting the direction of their work.

November 15, 2006

WDTS - PNNL SC Lab Appraisal for 2006 (narrative assessment supporting ratings)

Goal 1.0

The Science Education programs (SEP) at Pacific Northwest National Laboratory has dedicated itself to program and process improvement both of which are most evident by the overall quality of the internship and fellowship research products. SEP constantly seek opportunities throughout the lab and with headquarters where they can work in tandem to create multiple science education benefits and raise the visibility and need for science education.

Science Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Workforce Development for Teachers and Scientists					
1.1 Impact	A-	3.7	25%	0.93	
1.2 Leadership	A-	3.7	30%	1.11	
1.3 Output	Pass	4.3	30%	1.29	
1.4 Delivery	Pass	4.3	15%	0.65	
Overall WDTS Total					3.98

Goal 3.0

SEP is outstanding in their development and assessment of policies, procedures, and outcomes and then maximizes the results to create efficiencies. The office has focused time and talent on operating as a well integrated team and the results demonstrate a significant increase in productivity where student outputs are of superior quality and the research experience is a rich, productive experience.

Science Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Workforce Development for Teachers and Scientists					
3.1 Effective and Efficient Stewardship	A	3.9	20%	0.78	
3.2 Project/Program Planning and Management	A+	4.1	40%	1.64	
3.3 Communications and Responsiveness	A	4.0	40%	1.6	
Overall WDTS Total					4.02



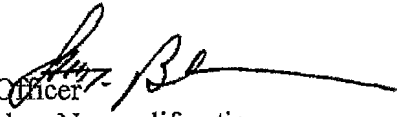
Office of Defense Nuclear Nonproliferation



Department of Energy
National Nuclear Security Administration
Washington, DC 20585
December 8, 2006



MEMORANDUM FOR: Julie Erickson, Acting Manager
Pacific Northwest Site Office

FROM: Steven K. Black 
Chief Operating Officer
for Defense Nuclear Nonproliferation

SUBJECT: Update: FY06 Performance Evaluation of Battelle for the
Management and Operation of the Pacific Northwest National
Laboratory (PNNL)

HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Defense Nuclear Nonproliferation (DNN)					
1.1 Impact	A	4.0	.25	1.0	
1.2 Leadership	A	4.0	.2	.8	
1.3 Output	A ⁺	4.2	.3	1.26	
1.4 Delivery	A	3.7	.25	.925	
Overall Defense Nuclear Nonproliferation Total					3.985

1.1 Impact:

The impact of PNNL's work, as it has been for several years, was wide-ranging and positive again this year. The Laboratory's work with the Office of Nonproliferation Research and Development has included successful research into technologies in a number of important areas, prominently including radiation detection, radiochemistry and remote sensing. PNNL produced a valuable report comparing alternative technical pathways to the PUREX process and found major differences in observable distinctions that can be used to discriminate between the PUREX and alternative processes. PNNL also continued its outstanding contributions to the infrared spectral signatures library, which this year reached a notable milestone of over 500 chemical signatures.

1.2 Leadership:

PNNL generally demonstrates good leadership and management skills, and has provided critical project integration, technical, and management support to a number of programs in the Office of Defense Nuclear Nonproliferation. For example, PNNL completed a rapid and creditable restructuring of its management of the Nonproliferation Graduate Program (NGP) Program earlier in the evaluation year. In addition, the Lab addressed some key concerns and developed proactive solutions to the challenge posed by delayed security clearances for the NGP Fellows. We are hopeful that FY07 will see an improvement in the average time required for security



clearances to be granted new NGP Fellows, and are aware that the Lab has only a limited ability to influence the pace of work largely done by the security and counterintelligence communities.

1.3 Output:

The Lab's self-assessment correctly claims that it "played a major role in the work of the Office of National Infrastructure and Sustainability, leading six different projects: (1) Regulatory Development; (2) Federal Inspection Implementation; (3) MPC&A Education; (4) MPC&A Equipment Certification; (5) Rosatom Training & Technical Infrastructure, and; (6) Protective Force Operations." The transition of MPC&A program work to Russian governmental responsibility and the sustainability of site and national-level MPC&A upgrades depend in the long run on the success of these six infrastructure projects; our view is that PNNL has done a very good job in helping implement them. While the technical quality of the Lab's work is unparalleled, we did experience some uncharacteristic challenges this past year in the areas of communication and coordination, about which more in the next section.

PNNL's work on tasks and projects associated with the Office of Nonproliferation and International Security met all targets for most programs, and exceeded targets for others. PNNL consistently provided outstanding support, demonstrating technical excellence, meticulous attention to detail, and innovative thinking, as well as the Lab's longstanding ability to deliver high-quality products on very short notice or in compressed timeframes. Examples of the above characteristics are evident in PNNL's work with the Georgian Institute of Physics in Tbilisi, Georgia, for the acquisition of samples from the decommissioned IRT reactor, and the Lab's excellent coordination of a multi-laboratory team's efforts to plan and execute a high-visibility UF₆ experiment known as *T-Genie*.

The Policy Office specifically wishes to cite excellent support provided by Carrie Matthews on GNEP, and by Tom Shea and Mike Curtis on India policy.

1.4 Delivery:

In its support to the MPC&A program PNNL participates on multi-laboratory technical teams assigned to implement nuclear material security upgrades at Mayak, Krasnoyarsk-45, and Sverdlovsk-44. PNNL representatives currently hold the technical lead role for "the Mayak project," but some potentially serious problems have arisen in recent months associated with the quality of communications and the nature of the relationship between headquarters program management and the technical implementation team at the Lab. Overall, as noted above, headquarters has been satisfied with the amount and quality of the technical support, but notes that the problems with the Lab team's relationship to headquarters management has deteriorated over time, and bears close lab management scrutiny. We remain optimistic that the Lab will work constructively with the program to address this problem quickly.

As noted elsewhere, PNNL does very high-quality scientific work for us across the board, but we also note that two small efforts associated with Pit Disassembly and Conversion Facility (PDCF) tasks end the year over budget and behind schedule. The headquarters program

manager is not worried about the substance of the work, but did note that this has happened in past years as well. The experiments themselves are small, in terms of funding, and the variances from the performance targets are admittedly not very large either (depending on whose descriptions you read, they range from 10 to 25 percent). However, the lab's response is what is noteworthy. The lab seems to downplay its own role in the delay and the cost growth, focusing instead on how the problem is caused by other participants, unanticipated contamination, the technical difficulty of the task, or the relative value to the customer of having PNNL do the work compared to another named lab. This amounts to selling the problem as not really significant to the customer, rather than simply fixing the problem, and it seems to us worth considering that this stance may be the root of the problem in the case of the Mayak project, which is not a small issue.

In that light, PNNL's annual self-assessment document could be strengthened by including a section that specifically calls out attention to "Areas For Improvement" over the coming year, either identified by the lab itself, or through interactions with the customer.

Finally, we note that PNNL's self-assessment includes discussion of its Nuclear Noncompliance Verification (NNV) work under the section concerning Warhead and Fissile Material Transparency (WFMT), and we therefore recommend an appropriate edit for accuracy's sake. The paragraph in question can be found on page 12 of the assessment and is reproduced in the footnote below.¹

We trust and rely on Mike Kluse and his staff to help us accomplish vital national security goals, and we are looking forward to another successful year in FY 2007.

If you have any questions, please contact me at (202) 586-0645.

cc: Terry Davis, PNSO
Ryan Kilbury, PNSO
John LaBarge, SC-1.4

¹ "PNNL provided plutonium verification and recovery support to NA-241 in FY06. Flow-sheets for processing solid plutonium bearing materials, which included equipment lists and specifications, were developed for the mobile plutonium processing facility (MPF). The logic diagrams for the use of nondestructive assay equipment in characterizing plutonium bearing materials, and the Functional Design Requirements were developed for the MPF. The specifications for an air bath calorimeter were developed and the calorimeter was delivered in FY06. Surveillance during the fabrication of key MPF equipment, such as gloveboxes and NDA equipment, was performed to ensure the equipment will meet mission needs. A list of Hanford personnel that could support the deployment and operation of the MPF was prepared." This paragraph should be included under WFMT.

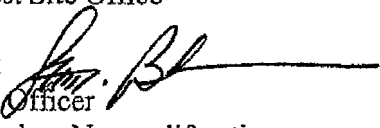


Department of Energy
National Nuclear Security Administration
Washington, DC 20585



December 15, 2006

MEMORANDUM FOR: Julie Erickson, Acting Manager
Pacific Northwest Site Office

FROM: Steven K. Black 
Chief Operating Officer
for Defense Nuclear Nonproliferation

SUBJECT: Update #2: FY06 Performance Evaluation of Battelle for
the Management and Operation of the Pacific Northwest
National Laboratory (PNNL) (Objective 3.x)

3.1 Effective and Efficient Stewardship (A+, 4.3)

PNNL consistently does an outstanding job developing and maintaining a wide range of competencies of great importance to Defense Nuclear Nonproliferation. The Lab plays a critical role in some half dozen areas of the MPC&A program in Russia, prominently including the difficult task of developing Russian self-sustainability. PNNL also does an unparalleled good job in the various areas associated the the Office of Nonproliferation and International Security, demonstrating technical excellence, meticulous attention to detail, and innovative thinking, as well as the Lab's longstanding ability to deliver high-quality products on very short notice or in compressed timeframes, as noted elsewhere in this evaluation. Examples of the above characteristics are evident in PNNL's work with the Georgian Institute of Physics in Tbilisi, Georgia, for the acquisition of samples from the decommissioned IRT reactor, and the Lab's excellent coordination of a multi-laboratory team's efforts to plan and execute a high-visibility UF₆ experiment known as *T-Genie*.

3.2 Project/Program Planning and Management (A, 4.0)

The impact of PNNL's program planning and management, as it has been for several years, was wide-ranging and positive again this year. The Laboratory's work with the Office of Nonproliferation Research and Development has included successful research into technologies in a number of important areas, including radiation detection, radiochemistry and remote sensing. PNNL produced a valuable report comparing alternative technical pathways to the PUREX process and found major differences in observable distinctions that can be used to discriminate between the PUREX and alternative processes. PNNL also continued its outstanding contributions to the infrared spectral signatures library, which this year reached a notable milestone of over 500 chemical signatures. There were a few minor instances of failure to anticipate technical, budget or schedule risk in the NA-26 program, and



one known instance of an avoidable problem involving contamination, which are the only reasons for downgrading this score from an A+ to an A.

3.3 Communications and Responsiveness (A⁻, 3.7)

As noted elsewhere in this evaluation, PNNL's support to the MPC&A program is very important to us, and the Lab participates on multi-laboratory technical teams assigned to implement nuclear material security upgrades at Mayak, Krasnoyarsk-45, and Sverdlovsk-44. PNNL representatives currently hold the technical lead role for "the Mayak project," but some potentially serious problems arose this past year associated with the quality of communications and the nature of the relationship between headquarters program management and the technical implementation team at the Lab. Overall, as noted above, headquarters has been satisfied with the amount and quality of the technical support, but notes that the problems with the Lab team's relationship to headquarters management has deteriorated over time, and bears close lab management scrutiny.

At one point, the lab seemed to downplay its own role in the delay and the cost growth of a couple of PDCF experiments, focusing instead on how the problem was caused by other participants, unanticipated contamination, the technical difficulty of the task, or the relative value to the customer of having PNNL do the work compared to another named lab. This struck us as selling the problem as not really significant.

On a positive note, we believe the Lab has already taken appropriate steps to remedy this potentially serious problem.

HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Defense Nuclear Nonproliferation (DNN)					
3.1 Effective and Efficient Stewardship	A ⁺	4.3	.35	1.5	
3.2 Project/Program Planning and Management	A	4.0	.25	1.0	
3.3 Communications and Responsiveness	A ⁻	3.7	.4	1.48	
Overall Defense Nuclear Nonproliferation Total					3.98



APPENDIX 3

Department of Homeland Security



Homeland
Security

1 November 2006

Ms. Julie K. Erickson
Acting Manager
Pacific Northwest Site Office
U.S. Department of Energy
P. O. Box 350
Richland, WA 99352

Dear Ms. Erickson:

Please find enclosed the Department of Homeland Security's (DHS's) evaluation of the performance of Battelle for managing and operating the Pacific Northwest National Laboratory (PNNL) for Fiscal Year (FY) 2006. The enclosed quantitative scores and narrative comments offer input on program activities conducted for DHS.

Thank you for this opportunity to offer DHS input into the DOE performance appraisal. Please direct any questions to Dr. Thomas Kiess (202-254-6015 or Thomas.Kiess@hq.dhs.gov) of my staff.

Sincerely,

A handwritten signature in black ink, appearing to read "J. V. Johnson".

James V. Johnson, Director
Office of National Laboratories
Science and Technology Directorate
Department of Homeland Security

Enclosure

cc w/enclosure:
T. Kiess, DHS/S&T ONI
L. Mamiya, PNSO
D. Biancosino, PNSO

ENCLOSURE: DHS Input to DOE on Battelle Contractor Performance for PNNL in FY 2006

Section I: DHS Ratings on PNNL FY 2006 Performance Measured Against Specific Contract Goals

Goal/Objective	Score
PNNL CONTRACT PERFORMANCE GOAL 1.0: Provide for Efficient and Effective Mission Accomplishment	
1.1 Science and technology results provide meaningful <i>impact</i> on the field (0 to 4.3)	4.0
1.2 Provide quality leadership in science and technology (<i>leadership</i>) (0 to 4.3)	4.1
1.3 Provide and sustain science and technology outputs that advance program objectives and goals (<i>output</i>)	3.6
1.4 Provide for effective delivery of science and technology (<i>delivery</i>)	4.2
PNNL CONTRACT PERFORMANCE GOAL 2.0: Provide Efficient and Effective Design, Fabrication, Construction, and Operations of Facilities [not in DHS realm]	
PNNL CONTRACT PERFORMANCE GOAL 3.0: Provide Effective and Efficient Science and Technology Research Project/Program Management	
3.1 Provide effective and efficient stewardship of scientific capabilities and program vision (0 to 4.3)	4.0
3.2 Provide effective and efficient science and technology project/program planning and management (0 to 4.3)	4.0
3.3 Provide efficient and effective communication and responsiveness to customer needs (0 to 4.3)	4.2
Other Performance Goal Relevant to Homeland Security	
Northwest Regional Stretch Goal: Becoming a regional leader for Homeland Security	4.0

Section II: Narratives to Support DHS Ratings

Goal 1.1: Science and Technology Results Provide Meaningful Impact on the [technical disciplinary] Field

DHS Comments (e.g., how well did DHS-sponsored project/program activities fulfill this goal):

One example of this is the leadership of Dr. Jerry Allwine of PNNL in the Urban Dispersion Program (UDP). He has led a multi-institution team to coordinate their efforts to advance the state of the practice in atmospheric dispersion studies, to include field tests and modeling developments. He was recognized as a featured speaker at a March meeting of the New York Academy of Sciences, where he overviewed UDP activities. Later in the year, he developed some response "rules of thumb" guidance from analysis to date of data his team collected last year. These results were well received by New York City, and motivate new frontiers of technical study that are relevant to homeland security applications.

As a second example, according to another DHS Program Manager commenting on a Standards project, "The project seeks to provide meaningful impact by creating or establishing interoperability through standards and guidelines developed, in part, by the ASTM subcommittee E54.02. The performer coordinates and manages the work items being developed in that subcommittee. One standard has been developed and several are under development."

Goal 1.2: Provide Quality Leadership in Science and Technology

DHS Comments (e.g., how well did DHS-sponsored project/program activities fulfill this goal):

PNNL has done excellent work in support of the DHS S&T Detection and Surveillance R&D program, providing critical support for the Protein Pipeline project for detection of pathogens and toxins, RNA signature development for pathogen identification and viability determination, and proteomic characterization of biothreat agents. The DHS point of contact at PNNL, Cindy Bruckner-Lea, in her capacity as deputy Thrust Area Coordinator (dTAC) for the Detection and Surveillance Thrust Area, has been very responsive and informative in keeping DHS abreast of their research achievements and progress and has worked closely with DHS to fulfill the goals of the Thrust Area Program Execution Plan.

The DHS-Preparedness Directorate's Infrastructure Protection Risk Management Division has appreciated the quality and timeliness of the PNNL support to the "Site Assistance Visits" and "Critical Reviews" conducted in FY 2006.

According to another DHS Program Manager, "The performer demonstrated leadership and innovative thinking by applying existing technology developed at PNNL to a specific DHS problem related to the evaluation of existing standards. They have exceeded expectations."

Goal 1.3: Provide and Sustain Science and Technology Outputs that Advance [DHS] Program Objectives and Goals

DHS Comments (e.g., how well did DHS-sponsored project/program activities fulfill this goal):
All DHS programs received adequate outputs. For example, according to one DHS Program Manager, "The novel application of PNNL technologies helped meet an objective of DHS (NIMS Integration Center) with respect to standards, i.e., promoting compatibility between national-level standards for the National Incident Management System and those developed by other public, private, and/or professional groups."

Goal 1.4: Provide for Effective Delivery of Science and Technology

DHS Comments (e.g., how well did DHS-sponsored project/program activities fulfill this goal):
From a DHS-Customs and Border Protection sponsor, PNNL is the primary technical agent for the DHS Radiation Portal Monitor Project (RPMP). In this role, they have successfully provided expert technical assistance and guidance at CBP field locations in support of deployments, and have provided technical experts at CBP and within DHS.

PNNL was quick to understand and respect CBP's dual mission of law enforcement and facilitation of international commerce. Working within these parameters, they developed and are executing a technical approach suitable for implementation in the Customs inspection environment. Many technical problems needed to be identified and solved in order to achieve success. The staff at PNNL continues to do an outstanding job of identifying, resolving, and implementing solutions to the various needs of the RPM project.

The degree of commitment and resolve of the staff at PNNL is outstanding. Their efforts have led to industry-wide product improvements that support CBP's mission. Their approach to problem solving is keenly focused on the implementation of a "scientific solution" in a practical fashion. They have listened to our needs and delivered.

CBP was the sole funding client for this project until FY 2006 at which time RPMP became a joint project between CBP and the DHS Domestic Nuclear Detection Office (DNDO). PNNL is now responsible for coordination between two government managers: one in CBP and one in DNDO for the execution of this high visibility and critical national security project. Although the transition has not been an easy one for any of us, PNNL has successfully adapted its management approach to address and foster a joint project that remains responsive to the DHS strategic goals.

Goal 3.1: Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

DHS Comments (e.g., how well did DHS-sponsored project/program activities fulfill this goal):

From a DHS-U.S. Coast Guard program manager: PNNL has provided superior technical support and expertise to the project. They performed a domain analysis of Coast Guard Sector Command Centers and documented that work in a Goal Directed Task Analysis of watch stander roles and responsibilities. Their software products have allowed the project to experiment with visualization and analytics technology in a cost-effective manner in comparison to generating new or prototype code to test the effectiveness of the technology on the watch stander's ability to maintain situational awareness. PNNL's staff have dispensed valuable advice on visualization and analytics technology which in turn has helped the Coast Guard to shape its research on how to provide efficient and effective maritime homeland security. PNNL has proven to be a good team player throughout the project, working well with both the Coast Guard and the Homeland Security Advanced Research Projects Agency.

Goal 3.2: Provide Effective and Efficient Science and Technology Project/Program Planning and Management

DHS Comments (e.g., how well did DHS-sponsored project/program activities fulfill this goal):

From a DHS principal broadly cognizant of many PNNL involvements: I have been impressed by the professionalism and responsiveness of PNNL researchers and staff. Mike Mitchell and Pam Cummings have been tireless in their support of University programs. Of particular note was their major effort in support of the Centers of Excellence Hill event on September 14.

Another example is the leadership of PNNL to coordinate the multi-lab "Science and Technology Action Team" (STAT) project, which delivered quality workproducts on time in response to a challenging DHS deadline. This project required that PNNL communicate effectively with many partners in order to assemble reference material and to conduct a telecom exercise. The significant participation of these partner institutions in STAT, and the elicitation of solid contributions from them, are due to PNNL's even-handed and inclusive leadership style.

Goal 3.3: Provide Efficient and Effective Communications and Responsiveness to Customer Needs

DHS Comments (e.g., how well did DHS-sponsored project/program activities fulfill this goal):

According to one DHS Program Manager. "I would like to recognize Mr. Nick Lombardo from PNNL for his contribution to the Systems Engineering Divisions Rail Security Pilot. Mr. Lombardo displayed outstanding engineering and program management expertise to ensure the pilot was within the appropriated cost and schedule."

According to another DHS Program Manager, "The performer that I work with is excellent with respect to customer service, and has exceeded expectations. The performer at PNNL is very responsive and has been an invaluable resource. The individual has attempted to bring his experience along with resources of PNNL to bear on a variety of tasks related to the development and evaluation of standards for the National Incident Management System."

Perspective of DHS-DNDO: The RPMP effort was initiated under the management and funding of CBP in 2002. Since that time, CBP has utilized PNNL as the integration and deployment agent for this effort.

DNDO was established in April 2005, and FY 2006 was the first year that funding for the RPMP effort was appropriated to DNDO instead of CBP for execution. Since DNDO would now be responsible for the acquisition and execution of the project, with CBP remaining the end-user responsible for interdiction, PNNL would now be accountable to two agencies instead of one. This was a challenge for PNNL.

It took some time for PNNL to appreciate that the RPMP needed a substantial adjustment to its structure in order to achieve the appropriate balance and support of its two customers. One major change that PNNL made was to appoint a new program manager who had both first hand knowledge and experience with CBP operational environments as well as experience and appreciation for the drivers of DNDO.

Related to this issue, DNDO and CBP expressed a lack of confidence in the transparency of communications and interactions with PNNL. This lack of trust made it difficult to establish effective day to day working-level discussions, and enable decisions to be made and the program to efficiently progress.

Building trust is a long-term process, however PNNL has made some big strides in achieving this goal. Working closely with both customers, PNNL has instituted strict communication protocols, to ensure that the appropriate personnel at both agencies are properly informed of all activities. Documentation processes and controls were also instituted to ensure that the product generated not only contained the required content and fidelity but was generated in the proper format. Also, a joint program review was held in June that both customers attended, and engaged in discussions on this subject as well as the programs current and future plans. Frank discussions about the need for transparency and trust by all three parties occurred, and were unanimously agreed upon. Conversations throughout the review brought forward each entities unique perspective, and went a long way in helping to each other understand and appreciate them.

At the program review in June, DNDO requested that PNNL re-baseline the project. Since the project has numerous projects going on at the same time, and a tracking database thousands of lines large, this was a big task. However, the result which was recently presented in August, is an updated, baseline that can allow both DNDO and CBP to more accurately track the programs progress and status, unencumbered by variations in the past. Since this had not been done before, PNNL took this opportunity to review its processes and procedures. In doing so, they were able to streamline the project and achieve numerous efficiencies, including lowering the average deployment cost and reducing the number of staff reporting to the project.

PNNL has continued to do an outstanding job at deploying and providing the scientific and technical support to interdiction systems to fulfill a critical national mission in an ever changing, ever

challenging operational, environmental and organizational environment. The issues mentioned above have either been resolved and/or continue to be addressed, as they require considerable effort over a period of time. PNNL is a professional organization, and to their credit, listens to their customers requirements and aggressively responds. I look forward to another challenging year managing the RPMP effort, with the excellent support of this team.

Northwest Regional Stretch Goal: Becoming a regional leader for homeland security

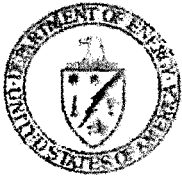
DHS Comments (e.g., how well did DHS-sponsored project/program activities fulfill this goal): PNNL has been proactive in bringing to DHS' attention security-related challenges associated with the 2010 Olympics in Vancouver, British Columbia. PNNL is poised to be a technical resource and asset to the upcoming security operations.

PNNL has been "forward leaning" in cultivating a relationship with King County, Washington. From this rapport, PNNL has enhanced its region's homeland security posture. For example, contamination of water treatment facilities following a radiological or nuclear event is an issue that PNNL has offered intellectual leadership on, benefiting not just the Northwest Region, but also the nation.



APPENDIX 4

Office of Energy Efficiency and Renewable Energy



Department of Energy
Washington, DC 20585

December 7, 2006

Mr. Paul Kruger
Manager
Pacific Northwest National Laboratory
U.S. Department of Energy
P.O. Box 350
Richland, WA 99352

SUBJECT: The Office of Energy Efficiency and Renewable Energy's
Performance Evaluation of Battelle Memorial Institute as the
Management and Operating Contractor of the Pacific Northwest
National Laboratory – Contract No.: DE-AC06-76RL01830

Dear Mr. Kruger:

The Office of Energy Efficiency and Renewable Energy (EERE) has completed its evaluation of Battelle Memorial Institute's performance in managing science and technology at the Pacific Northwest National Laboratory (PNNL) for the performance period beginning October 1, 2005, and ending September 30, 2006. The evaluation report is enclosed for your information.

Five of the ten EERE Programs, Biomass, Building Technologies, FreedomCAR and Vehicle Technologies, Hydrogen, Fuel Cells and Infrastructure Technologies, and Industrial Technologies, each having obligated \$1.0 million or more to PNNL, were asked to submit evaluations.

EERE graded PNNL for three performance goals. The laboratory received a grade of "A+" for *Effective and Efficient Operation of Facilities*, and a grade of "A" for the other two performance goals, *Accomplish Mission* and *Effective Science and Technology Research Project and Program Management*.

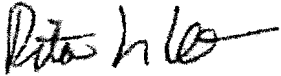
An EERE grade of "B+" or higher signifies that the laboratory's achievements toward the performance goals translate to substantive accomplishments and results for the Program.

In fiscal year 2007, EERE will be assessing the laboratories energy performance accomplishments based on executive orders, departmental guidelines and energy performance metrics established by EERE.

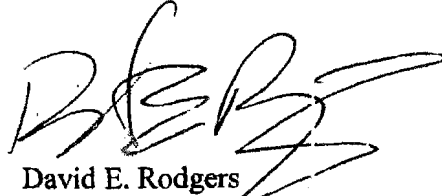


If you have any questions concerning this evaluation, please contact Mr. Marvin Gorelick via e-mail at: marvin.gorelick@ee.doe.gov or by phone at: (202) 586-9436.

Sincerely,



Rita L. Wells
Deputy Assistant Secretary
Business Administration
Energy Efficiency and Renewable Energy



David E. Rodgers
Acting Deputy Assistant Secretary
Technology Development
Energy Efficiency and Renewable Energy

Enclosure

cc: Julie K. Turner
Programs Division
U.S. Department of Energy
Pacific Northwest National Laboratory
902 Battelle Blvd.
P.O. Box 999
Richland, WA 99352

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy

Performance Evaluation Report of the Battelle Memorial Institute for
Management and Operations of Science and Technology at the

Pacific Northwest National Laboratory
(Contract No. DE-AC06-76RL01830)

For the Period October 1, 2005 – September 30, 2006

October 31, 2006

EXECUTIVE SUMMARY

The Office of Energy Efficiency and Renewable Energy (EERE) participates in the award-fee evaluation process to assess the performance of a National Laboratory in the area of science and technology. This requirement originates from the annual "Standards of Performance-based Fee" clauses negotiated between the U. S Department of Energy (DOE) and a contractor managing and operating (M&O) a National Laboratory. Existing contracts call for annual evaluations. The result of the evaluation — the overall weighted score for the science and technology goals awarded by all DOE programs — determines the percentage of the available performance-based fee that the M&O contractor earns.

EERE prepared this evaluation as its input to the DOE award-fee evaluation of the Battelle Memorial Institute's performance for the management and operation of the Pacific Northwest National Laboratory (PNNL). A compilation and integration of evaluations received from the EERE programs sending funding to the laboratory, it assesses PNNL's performance of work from October 1, 2005, to September 30, 2006. The overall grade for each Performance Goal represents a weighted average of grades received from the EERE program offices, using each program's FY 2006 obligations at PNNL as of August 31, 2006, as the weighting factor.

Five of the ten EERE programs, namely Biomass (BP), Building Technologies (BTP), FreedomCAR and Vehicle Technologies (FCVT), Hydrogen, Fuel Cells, and Infrastructure Technologies (HFCIT), and Industrial Technologies (ITP), each having obligated \$1.0 million or more to PNNL, were asked to submit evaluations. These are their grades:

LETTER GRADES BY PERFORMANCE GOAL	GOAL 1: ACCOMPLISH MISSION	GOAL 2: EFFECTIVE AND EFFICIENT OPERATION OF FACILITIES	GOAL 3: EFFECTIVE SCIENCE AND TECHNOLOGY RESEARCH PROJECT AND PROGRAM MANAGEMENT
BIOMASS PROGRAM	A	A	A
BUILDING TECHNOLOGIES PROGRAM	A	N/A	A
FREEDOMCAR AND VEHICLE TECHNOLOGIES PROGRAM	A+	A+	A+
HYDROGEN, FUEL CELLS, AND INFRASTRUCTURE TECHNOLOGIES PROGRAM	A	A	A
INDUSTRIAL TECHNOLOGIES PROGRAM	B+	N/A	B+
OVERALL LETTER GRADE	A	A	A

Grades of B+ or higher signify that PNNL's work toward a goal translates to substantive performance and results for the program.

INTRODUCTION

This evaluation has been prepared as part of the DOE contractual obligation to assess the Battelle Memorial Institute's performance for the management and operation of science and technology at PNNL. Specifically, it assesses PNNL's support of DOE's EERE program offices in science and technology and its ability to assist these program offices in maintaining the overall EERE mission: to strengthen America's energy security, environmental quality, and economic vitality through public-private partnerships.

This evaluation report, covering the period from October 1, 2005, through September 30, 2006, comprises five sections. The first section highlights the given performance goals, objectives, and measures provided to each DOE EERE technical program office. The second addresses the process followed to grade the laboratory's performance. The third section presents the overall grades resulting from the evaluation. The fourth section lists key achievements and areas of concern. The fifth and final section provides guidance for the next performance period.

PERFORMANCE GOALS, OBJECTIVES, AND MEASURES

This evaluation focuses on grading the contractor's performance against Performance Goals as described below. Each evaluator measures progress against these Performance Goals using a set of Performance Objectives and Performance Measures, defined as follows:

- Performance Goal: This is a general overarching statement of the desired outcome for each major performance area.
- Performance Objective: An objective is a statement of desired results for an organization or activity within a major performance area.
- Performance Measure: A performance measure provides a reviewer a quantitative or qualitative method for characterizing performance to assist in assessing achievement of the corresponding Performance Objective.

The Performance Goals and Performance Objectives used by EERE, for the most part, adopt the standardized versions of goals and objectives defined by the Office of Science, as stated in the following:

- Goal 1: Accomplish Mission
 - Objective 1.1: Accomplish Mission
 - Objective 1.2: Leadership
 - Objective 1.3: Produce high-quality, original, and creative results that advance science and technology (recognition of Science and Technology breakthroughs)
 - Objective 1.4: Delivery
- Goal 2: Effective and Efficient Operation of Facilities
 - Objective 2.1: Provide effective and efficient operation of facilities supporting the EERE program
- Goal 3: Effective Science and Technology Research Project and Program Management

- Objective 3.1: Effective program vision and leadership.
- Objective 3.2: Effective and efficient science and technology project and program planning and management.
- Objective 3.3: Efficient and effective communications and responsiveness to EERE and EERE Project Management Center (PMC) needs.

EERE also adjusted the Performance Measures under Goal 1 to include success in meeting program milestones and other criteria appropriate to applied research. EERE uses only one Performance Objective under Goal 2, namely the effective and efficient of operating facilities to support EERE programs.

EVALUATION PROCESSES: LETTER GRADES AND AVERAGING

EERE programs assigned a letter grade to each performance goal. Each letter grade translated into a numeric grade, using the evaluator's Input Rating Scale, for example 4.3 = A+, 3.9 = A, 3.3 = B+.

EVALUATOR'S INPUT RATING SCALE											
Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
Score	4.3	3.9	3.6	3.3	2.9	2.6	2.4	1.9	1.4	0.9	0.4

After collecting the grades, EERE weighted them against specific program obligations for FY 2006 at PNNL as reported in the DOE Standard Accounting and Reporting System report as of August 31, 2006. See the following table for total funding allocated to each program.

PROGRAM OFFICE	FY 2006 OBLIGATIONS AT PNNL AS OF 8/31/2006 (\$ THOUSANDS)
BIOMASS PROGRAM	\$4,327
BUILDING TECHNOLOGIES PROGRAM	\$4,751
FREEDOM CAR AND VEHICLE TECHNOLOGIES PROGRAM	\$7,849
HYDROGEN, FUEL CELLS, AND INFRASTRUCTURE TECHNOLOGIES PROGRAM	\$2,720
INDUSTRIAL TECHNOLOGIES PROGRAM	\$1,929
TOTAL	\$21,575

EERE then computes a weighted average grade for each Performance Goal (Objective).

The following example illustrates the algorithm used to compute a weighted average.

A	B	C	D	E
PROGRAM	LETTER GRADE	NUMERICAL SCORE	PERFORM. OBLIGATIONS	WEIGHTED SCORE
One	A+	4.3	\$2,000,000	8,600,000
Two	A	3.9	\$20,000,000	78,000,000
Three	B+	3.3	\$6,000,000	19,800,000
SUM			\$28,000,000	106,400,000
WEIGHTED AVERAGE (SUM OF COLUMN E/SUM OF COLUMN D)				3.80

EERE converted the computed average back to a letter grade using the following scheme:

AVERAGE SCORE TO LETTER GRADE CONVERSION TABLE											
Score	4.16 - 4.30	3.76 - 4.15	3.46 - 3.75	3.16 - 3.45	2.76 - 3.15	2.46 - 2.75	2.16 - 2.45	1.66 - 2.15	1.16 - 1.66	0.6 - 1.15	<0.6
Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F

OUTCOME BY PERFORMANCE GOAL

EERE rated the Battelle Memorial Institute's performance for FY 2006 with a grade of "A+" for Effective and Efficient Operation of Facilities, and a grade of "A" for the remaining Performance Goals, namely, Accomplish Mission and Effective Science and Technology Research Project and Program Management. The following table highlights the grades issued by each of the program offices.

LETTER GRADES BY PERFORMANCE GOAL	GOAL 1: ACCOMPLISH MISSION	GOAL 2: EFFECTIVE AND EFFICIENT OPERATION OF FACILITIES	GOAL 3: EFFECTIVE SCIENCE AND TECHNOLOGY RESEARCH PROJECT AND PROGRAM MANAGEMENT
BIOMASS PROGRAM	A	A	A
BUILDING TECHNOLOGIES PROGRAM	A	N/A	A
FREEDOMCAR AND VEHICLE TECHNOLOGIES PROGRAM	A+	A+	A+
HYDROGEN, FUEL CELLS, AND INFRASTRUCTURAL TECHNOLOGIES PROGRAM	A	A	A
INDUSTRIAL TECHNOLOGIES PROGRAM	B+	N/A	B+
OVERALL EERE GRADE			

SELECTED EXAMPLES OF ACHIEVEMENTS AND DEFICIENCIES

EERE, in the order of each Performance Goal, has highlighted selected major achievements recognized throughout FY 2006. It also addresses certain areas within the PNNL research and development (R&D) environment needing management attention.

GOAL 1: ACCOMPLISH MISSION with the following objectives:

- Sustained scientific progress and impact.
- Leadership (as recognized by science and technology accomplishments).
- Advance science and technology with high-quality, original research, and creative results.
- Advance the research, development, and demonstration goals of EERE and its stakeholders.

SIGNIFICANT ACHIEVEMENTS

Biomass Program

PNNL and the DOE Joint Genome Institute released the first public sequence of *Aspergillus Niger* (*A. niger*), an important filamentous fungus used to manufacture industrial enzymes and organic acids. Industry has used this filamentous fungus for nearly 100 years to make organic acids, notably citric acid, and several biomass-processing enzymes. The sequence of this organism provides information that will accelerate progress toward meeting the Office of Biomass Programs' goal to convert biomass to fuel ethanol economically. The sequencing of *A. niger* is an example of the collaboration between the Office of Science, Office of Biological and Environmental Research, EERE's Biomass Programs, and PNNL.

Building Technologies Program

PNNL is the trendsetter in the Building Energy Codes field. In FY 2006, the International Code Council restructured and revised its International Energy Conservation Code based almost entirely on work done by the Building Energy Codes Program (BECP) at PNNL. The American Society of Heating Refrigerating and Air-Conditioning Engineers and the Illuminating Engineering Society of North America upgraded the national standard commercial building code resulting in a model code that is about 6 percent more stringent than the previous code, under the leadership of its Lighting Subcommittee chairperson from the BECP at PNNL. During FY 2006, the number of Web site hits on the BECP site (www.energycodes.gov) increased by 50 percent from the previous year, to 3 million hits per month. This site is the primary source for technical assistance on building energy codes in the country. Increased downloads of tools and materials is responsible for this increase. The program has successfully transitioned to Web-based training mode and almost doubled its attendance per session from 700 to 1,200 – 1,400 people.

The Building America (BA) PNNL team, in coordination with Oak Ridge National Laboratory (ORNL), has achieved a very significant goal of completing the initial five volume series of Best Practices Handbooks for builders for the five major climates in the United States. These documents, based upon the results of the past decade of BA research results at the 30 percent heating and cooling (15 percent whole house) level, have been extremely well received by the building community.

FreedomCAR and Vehicle Technologies Program

In this past year, PNNL has contributed substantially to the Advanced Combustion Engine R&D program. Their scientific impact in the field of efficient nitrogen oxides (NO_x) and particulate abatement has been long recognized as world class and continued in this past year as demonstrated by numerous significant and notable achievements. The international community recognizes their work on efficient diesel particulate filtration through the Exhaust Emission Science Laboratory (EESL) as leading edge. Their leadership in catalysis through the Institute of Interfacial Catalysis (IIC) has lead to significant advances in the field of diesel NO_x adsorber technology. As an illustrative example, Chuck Peden, Associate Director of the Institute for Interfacial Catalysis at PNNL and principle investigator of FCVT funded studies of lean-NO_x trap (LNT) materials, was invited to participate in a National Science Foundation funded workshop aimed at identifying the scientific and technological impact, and future instrument development needs for environmental (in-situ) transmission electron microscopy (eTEM). Chuck Peden was the only non-microscopist participant invited to the workshop in recognition of his group's first in-situ eTEM studies of morphology changes in LNT materials. His group performed its experiments on one of only two such instruments in the world suitable for catalysis studies.

PNNL lead industry-working groups (e.g., Cross-Cut Lean Exhaust Emissions Reduction Simulations) in the area of diesel particulate filtration and urea-selective catalytic reduction. They chair topical sessions at leading conferences and host distinguished lecture series.

PNNL continues to support multiple projects in the Polymer Composite R&D plan, with focused efforts on the continuation of the Predictive Modeling of Polymer Composites processing in collaboration with the Automotive Composites Council, the American Plastics Council, and ORNL. This project will develop critical predictive design tools for optimizing processing and part design of polymer composite automotive components and for predicting their in-service performance. The second proposed agreement will investigate the development of natural fiber composite materials for use in structural and semi-structural automotive applications.

Initiated in FY 2006, the Low-Cost Carbon Fiber Production project focuses on the development of a lignin purification process that the industrial partner, MeadWestvaco, can implement. The use of lignin as a precursor for carbon fiber production offers the greatest potential for meeting FreedomCAR carbon fiber cost goals, making this project a high priority with great potential to enable the use of carbon fiber composites for significant vehicle lightweighting.

In the Automotive Metals agreements, PNNL continues to focus on developing and characterizing advanced forming methods for aluminum, advanced high strength steels, and titanium. PNNL developed additional new proposals in magnesium, metal matrix composites, metallic foams, and alternate forming and joining processes in conjunction with automotive original equipment manufacturers and suppliers for FY 2007 and beyond. These investments will allow for significant lightweighting of future vehicles, independent of the propulsion system type (i.e., fuel cell, internal combustion engine, and hybrid).

PNNL was instrumental in the coordination and technical assessment of the multi-national

Magnesium Front End program, which includes not only U.S. participants, but also leverages R&D investments and expertise in Canada and China in magnesium technologies. Through this program, the participants will demonstrate a lightweight automotive front end.

In FY 2006, multiple PNNL staff and principal investigators received invitations to give talks on materials and technologies that are under development through the FCVT program.

Projects/topics of these invited talks include production of low-cost metal matrix composites, behavior of Transformation Induced Plasticity steels, titanium powder metallurgy, electromagnetic forming of aluminum, the performance of thread forming fasteners in applications, and friction stir welding of sheet materials for applications in body in white structures. The automotive community recognizes PNNL as experts in these areas, as well as other material processing and modeling methods.

In recent studies performed in the IIC at PNNL in the area of catalysis, researchers identified remarkable structural changes in LNT catalyst materials during their operation. The research found that the NO_x storage component of the LNTs, barium oxide (BaO), undergoes significant yet reversible changes in its morphology as NO_x was stored and released. The results are serving to guide catalyst manufacturers in the development of optimum materials for controlling NO_x emissions from diesel and other lean-burn engines. These studies took advantage of unique facilities for performing time-resolved x-ray diffraction under realistic conditions of temperature and pressure at the National Synchrotron Light Source (NSLS), Brookhaven National Laboratory (BNL). Along with the PNNL IIC research team, participants in the research also include Prof. Bill Epling, formerly of Cummins, Inc. and now at the University of Waterloo, and Jon Hanson, a BNL chemist at the NSLS.

Other significant accomplishments in the area of diesel NO_x Adsorber Materials include the following activities:

- Developed an understanding of the mechanisms of LNT deactivation due to high temperatures and the presence of sulfur species in the exhaust, and applied this knowledge for determining appropriate operating conditions and the development of protocols and tools for failure analysis of used catalysts.
- Platinum (Pt) sintering as a primary cause of LNT performance degradation was clearly established. Thus, it has become a primary concern to establish "routine" methods to determine Pt particle size in aged parts from the field in order to establish clearly their mode of failure.
- Carbon dioxide and H₂O were shown to significantly enhance the reductive removal of sulfur species and reduce the formation of a "refractory" barium sulfide phase.
- LNT material morphology shown to affect NO_x uptake and release temperatures, the relative ease of sulfur removal, and the formation of a deactivating BaAl₂O₄ phase.
- Performed first nitrogen balance experiments during an LNT lean-rich cycle, identifying the distribution of nitrogen-containing species as a function of reduction time.
- Three public presentations and three manuscripts have been cleared for release by the Cooperative Research and Development Agreement (CRADA) partners.

In the area of diesel particulate filtration, PNNL's work contributed to the successful

demonstration of Dow Automotive's innovative particulate filter on an Audi diesel-powered racecar. An Audi racecar registered the first overall win for a diesel engine at the recent LeMans 24-hour endurance race. Critical to the success of the car was the highly durable and effective exhaust particle filter developed and constructed by DOW. Over the past two years, PNNL and ORNL have performed R&D in CRADAs and direct-funded efforts on behalf of DOW in support of this technology. PNNL has constructed and exercised computer models to aid in the design of the filter material and configuration. ORNL conducted soot loading and regeneration experiments in their engine lab with small samples of the filter material.

Hydrogen, Fuel Cells, and Infrastructure Technologies Program

PNNL demonstrated a viable path forward to meet the DOE EERE 2010 targets for bipolar plates. Screening tests of thin niobium - clad steel indicate negligible weight loss in corrosion testing, acceptably low corrosion current densities in half-cell testing, and contact resistance low enough to meet the 2010 targets as well as stack developer's operational requirements.

PNNL demonstrated the viability of a second clad material (nickel - clad) that has gained interest from several Proton Exchange Membrane Fuel Cells (PEMFC) stack developers, including Hydrogenics, Inc., who will collaborate on this project in FY 2007 by conducting multi-cell stack tests using Ni-clad bipolar plates.

PNNL received three awards for outstanding technical work during the Hydrogen Program's Annual Merit Review (Tom Autrey for B-N compounds for hydrogen storage, Marilyn Placet for web-based Analysis Resource Center and Daryl Brown as part of the H2A Delivery Team).

Through in - situ nuclear magnetic resonance (NMR), PNNL determined that the hydrogen release rate in solid ammonia borane is governed by a nucleation and growth mechanism. Using PNNL's data, their preliminary estimates indicate that a reaction volume of 6 liters may be ample to enable meeting the DOE 2010 rate target for hydrogen release. This result directly supports the goal for hydrogen release rate within the DOE Multi-year RD&D Plan.

The laboratory program developed in-situ NMR capability for studying hydrogen storage materials at elevated temperatures (up to 200 °C). Preliminary study on the Li-N-H system has demonstrated that the in-situ NMR is a powerful tool to understand hydrogen storage materials and sorption/desorption processes. It quantitatively determined gravimetric and volumetric hydrogen density for first equivalent of hydrogen released from solid ammonia borane. This is important to determine performance of the material vs. DOE goals.

Preliminary results on highly loaded scaffolds show that as the ammonia borane content is increased beyond a 1:1 ratio, kinetics, thermodynamics, and byproducts begin to approach the neat material. This is a key result indicating that the weight penalty of the scaffold may be too significant to allow such a material to meet DOE goals.

Overall, outstanding synergy between basic and applied science can be seen within the storage activities.

Industrial Technologies Program

PNNL R&D is using cutting-edge science to address industrial challenges and ITP technology priorities for waste heat recovery and for degradation resistant manufacturing components. PNNL has designed pre-ceramic polymer materials and developed a process to apply them as coatings to provide coking and carburization corrosion resistance in industrial process environments. These coatings are being evaluated for use in steam-methane reforming operations in industrial pilot scale tests. PNNL has provided key technical analysis to identify industrial waste heat reuse as a large energy savings opportunity. PNNL has developed a process to fabricate thin film thermoelectric elements with a figure of merit well above that of conventional materials and is working with industrial partners to integrate these into heat recovery units for the plant floor.

NOTABLE ACHIEVEMENTS

Biomass Program

PNNL continues to provide impactful results and strategic partnering contributing to the development and deployment of science and technology. These results support the advancement of the goals and objectives of the BP.

PNNL continues to provide scientific and programmatic leadership that guides the development of clean, efficient, and affordable energy systems.

Todd Werpy, a PNNL Program Manager, was requested by BP to provide technical support for program planning activities and guidance in developing program plans to ensure the achievement of the program's role in meeting both the Advanced Energy Initiative (AEI) and the requirements of the Energy Policy Act of 2005. Todd's technical expertise and experience provides critical input in the development of program plans to meet the outlined objectives.

PNNL continues to expand interactions with industry and its sister laboratory, the National Renewable Energy Laboratory (NREL), in various areas. Most notably, this would involve jointly designing a program with NREL to convert biomass derived pyrolysis oils to gasoline and other products with UOP, a company that supplies technology to the petroleum industry.

In FY 2005, PNNL organized the first International Symposium on Fungal Proteomics in Portland, Oregon. Recognizing the importance of this area, the Society of Industrial Microbiologists has adopted this meeting and held the Second International Symposium on Fungal Proteomics in Baltimore, Maryland, during August 2006. PNNL is recognized for its leadership in establishing this symposium series.

PNNL was recognized by its peers for providing innovative science and technology that advanced BP objectives and goals. The fungal biotech project headed by Linda Lasure held its annual Industry Review meeting in January 2006, at which industry leaders were very pleased with the progress being made. Of particular note was the project's success in publishing the genetic

sequence for one of the key organisms, *A. Niger*.

PNNL delivered program outcomes and objectives in accordance with work plans and submitted deliverables on time and within budget.

Building Technologies Program

PNNL exhibited strong R&D capabilities in its work on wireless controls and monitoring of heating, ventilation, and air conditioning systems in commercial buildings. PNNL developed a strong bond with a marketing partner. PNNL was able to foresee the potential impacts on how this technology changes the way buildings will be planned, designed, built, and maintained in the future.

PNNL's building technology introduction group successfully transitioned from conventional lighting technology to solid-state lighting. They provided technical expertise to and formed close relationships with lighting industry groups to advance significantly solid-state lighting in the marketplace. PNNL created the solid-state lighting commercialization plan and the first ever "beta" ENERGY STAR criteria for solid state lighting that were well received by industry. PNNL also coordinated activities of standard setting bodies to develop lighting measurement and performance standards.

FreedomCAR and Vehicle Technologies Program

In the field of diesel particulate filtration, a micro-scale model developed at PNNL uses lattice-Boltzmann method to solve for 3-D flow field through porous microstructure of filter wall. Discrete particle simulation predicts location and properties of soot deposits. Specific notable achievements from this work include:

- Developed technique for reconstruction of 3-D microstructures from a small number of 2-D pictures; and
- Developed a unique single channel validation test procedure for diesel particulate filters that allows for optimal interrogation of the soot cake layer.

Hydrogen, Fuel Cells, and Infrastructure Technologies Program

HFCIT met the two milestones for FY 2006, namely to report on the initial results to optimize the clad bipolar plate material and to complete the initial investigation of clad material formability.

Complete thermodynamics have been determined for the cyclic products of ammonia borane dehydrocoupling. This is the first step in identifying an efficient regeneration pathway that will allow a chemical-based hydrogen storage material.

The laboratory demonstrated measurement of hydrogen uptake in a non-porous crystalline organic clathrate.

Published molecular dynamics modeling paper on hydrogen storage in hydroquinone clathrate in Journal of Physical Chemistry and image placed on the journal cover.

PNNL staff delivered 18 presentations at university seminars, national and international meetings, and various symposia of relevance to hydrogen storage. Many of the presentations were invited lectures in recognition of PNNL's national and international impact on the field of hydrogen storage. In addition, they produced two manuscripts for scientific publication in highly - cited journals.

PNNL developed a new collaboration with Hydrogenics, Inc. who will carry out single and multi-cell stack testing in FY 2007 on the various bipolar plate materials developed by PNNL and Engineered Materials Solutions, Inc (EMS). The two collaborations established on this project have and will continue to allow PNNL to leverage DOE EERE's funding and thereby accelerate progress on this project.

NOTABLE DEFICIENCIES

Building Technologies Program

The lighting research and development (LR&D) element of BTP is focused on solid state lighting, with activities largely in physics, chemistry, and electrical engineering of semiconductors (applied research for breakthroughs). The focus of the Light Right project that PNNL does for BTP does fall within the broad range of EERE's mission, but is not a good fit with LR&D. The project is not related to semiconductor science/engineering. Moreover, it is not advancing pre-commercial technology in a "push the envelope" sense for the respective area. Most activities are market-based, human response studies or demonstration of lighting design. Light Right supports high-quality lighting design, almost hygienic, for the lighting industry. Designing to a higher level is difficult to argue with; however, a clear, singular link between energy efficiency and the goals of Light Right is not certain during the designing process.

GOAL 2: EFFECTIVE AND EFFICIENT OPERATION OF FACILITIES with the objective of effective and efficient operation of facilities.

SIGNIFICANT ACHIEVEMENTS

FreedomCAR and Vehicle Technologies Program

During FY 2006, PNNL significantly upgraded the laboratory's capabilities for the EESL. The EESL is a multi-disciplinary research center with a primary focus on supporting the mission of EERE's FCVT, with special emphasis on the Advanced Combustion Engine R&D Program. EESL is applying nationally recognized expertise in surface chemistry, catalyst mechanisms, materials synthesis, aerosols and modeling of multi-phase flow and chemical processes to address the challenges associated with diesel engine exhaust emissions abatement. Principal activities conducted in EESL include:

- Probing and understanding performance-limiting, nanometer- to micrometer-scale phenomena in after-treatment devices.
- Experimentation and modeling focused on mesoscale aspects of emissions reduction technology.

- Use of unique analytical observatories to characterize emissions phenomenon.
- Rapid materials innovation and evaluation of parameters specific to each after-treatment approach.
- Application of an integrated approach covering mechanism investigation, modeling, and materials/system optimization, leading to validation in engine/dynamometer tests.

In FY 2006, the EESL's heavy-duty engine dynamometer facilities were brought fully on-line. In addition, PNNL developed unique in-situ infrared visualization capabilities for diesel aftertreatment devices.

During FY 2006, PNNL improved its laboratory capabilities by adding two significant pieces of equipment: (1) a stir-casting unit for producing metal matrix composite materials of aluminum and magnesium, in which the design and process utilized is based on technology developed as part of the now-completed Low-Cost Cast Aluminum Metal Matrix Composite project, and (2) a speckle-pattern interferometer for in-situ strain measurements during formability characterization.

PNNL as a lab continues to be recognized as best in class in regards to environmental management and worker safety and health. This includes the labs where work was conducted in support of the FCVT program. There were no incidents of injuries, or environmental issues associated with the FCVT programmatic work performed at PNNL in FY 2006.

These capabilities have been developed to support multiple OFCVT project activities, as well as in response to automotive original equipment manufacturer's research needs.

Hydrogen, Fuel Cells, and Infrastructure Technologies Program

PNNL established electrochemical, corrosion, and conductivity testing capabilities at PNNL to develop new PEMFC bipolar plate materials. These capabilities are used to evaluate the performance (materials design and processing) of each of the two down-selected materials relative to final component cost.

PNNL developed a strong collaboration with EMS, who provides material cost and process expertise on the project and produces the various materials under study.

NOTABLE ACHIEVEMENTS

Biomass Program

PNNL and Washington State University (WSU) made substantial progress establishing the Bioproducts, Sciences, and Engineering Laboratory (BSEL), including completion of the detailed building design and groundbreaking in April 2006. BSEL is a \$24 million joint effort between WSU and PNNL through which researchers will focus on biomass research to create bio-based products such as plastics, solvents and fibers. BSEL will enhance and expand PNNL capabilities provided to EERE biomass research and other programs.

GOAL 3: EFFECTIVE SCIENCE AND TECHNOLOGY PROJECT / PROGRAM

MANAGEMENT with the following objectives:

- Sustained scientific progress and impact.
- Leadership (as recognized by science and technology accomplishments).
- Advance science and technology with high-quality, original research, and creative results.
- Advance the research, development, and demonstration goals of EERE and its stakeholders

SIGNIFICANT ACHIEVEMENTS

Biomass Program

PNNL provided program planning to meet client and industry needs for innovative solutions that advanced the development of secure, clean, and affordable energy systems while being responsive to changing scientific and fiscal conditions as well as the President's AEI and the guidance contained in the Energy Policy Act of 2005.

Building Technologies Program

The BECP operated exceptionally under extremely adverse conditions in FY 2006 with the following significant achievements:

- EERE reorganized in January, combining the BECP deployment activities in the Weatherization and Intergovernmental Programs with the code development activities in the BTP under new BTP management. The BECP proactively established briefings and backup for the Program Managers to brief new management. Effective Web presentations were organized to brief Headquarters (HQ) personnel who could not travel and to overcome HQ concern about cost of lab personnel travel.
- The FY 2007 BECP deployment portion of the program was zeroed out in the President's budget. The BECP performed its work so well (see Goal 1) and kept its staff so focused and committed, that HQ is reassessing this decision for FY 2008.
- The Federal Codes (codes for Federal agencies) were shifted from BTP to the Federal Energy Management Program (FEMP) during a congressionally mandated, time constrained rulemaking. BECP staff facilitated the transfer by keeping multiple parties in both BTP and FEMP informed of progress, and with extremely quick turn around on technical tasks.
- The six EERE Regional Offices (RO) supporting the BECP were eliminated and consolidated into the PMC at the National Energy Technology Laboratory. The BECP kept departing RO staff fully engaged in providing programmatic information and proactively filled in gaps as RO staff left. Input from and communications with partners, collaborators, and stakeholders was maintained and enhanced.
- Approval of the 2006 National Workshop was delayed for six months, and involved conflicting approval by EERE and disapproval by the Office of Science. BECP proactively worked with staff from both offices to help resolve the issue.
- Rules governing the 2006 National Workshop changed four months before the workshop. The BECP proactively developed and implemented strategies for adapting to the situation and allowing the workshop to proceed, drawing record attendance.
- The HQ Program Manager for the 2006 National Workshop was hospitalized the evening

before and throughout the workshop. BECP proactively stepped in and covered all voids, resulting in an extremely successful workshop.

The Building Energy Analysis team at PNNL has provided excellent technical support to BTP in a number of areas. The execution of the Government Performance and Results Act analysis for the FY 2007 and FY 2008 budget cycles has been exemplary, not only in meeting the DOE EERE requirement, but also in developing project and sub-program estimates useful in BTP portfolio analyses. PNNL technical support for multi-year planning and in stage-gate R&D process development has been excellent and has improved BTP planning over past cycles. A specific analytical product, "The Impact of DOE Building Technology Energy Efficiency Programs on U.S. Employment, Income, and Investment," by Michael Scott (et al.) was submitted to the refereed journal, *Energy Economics*. This paper provided important new perspectives on the potential economic impacts of the BTP program, and led to follow-on analytical work related to lost opportunities in buildings efficiency research.

FreedomCAR and Vehicle Technologies Program

PNNL has acted prudently in the management of its programs and has committed to meeting carryover funding targets through focused project management and reallocation of funds to new project areas. PNNL is assuring that highly competent and nationally recognized staff is assigned to the Advanced Combustion Engine projects as evidenced by our publication and presentation record, and by participation in numerous technical societies and industry working groups. PNNL actively participates in the FreedomCAR program through membership in the 21st Century Truck Partnership Team, and provides technical management and planning for several thrust areas under direction of the FCVT managers.

PNNL staff published extensively in numerous peer reviewed journals, trade journals, and conference proceedings. PNNL provided annual and semi-annual technical reports on all active projects, and provided timely input and updates on major project milestones. Extensive efforts have been ongoing to establish and maintain useful and productive collaborations with researchers at ORNL, Sandia National Laboratories, and Lawrence Livermore National Laboratory. These collaborative efforts include the coordination of activities through the Cross-Cut Lean Exhaust Emissions Reduction Simulations program. Through these collaborative efforts, it is believed that PNNL (and ORNL) bring to FCVT high-value research capabilities that exceed what the laboratories can bring individually.

PNNL has consistently maintained a record of innovation and high-quality research. Two examples are given for illustration:

- Newly Invented Desulfurization Strategy Leads to Reduced Deactivation of Lean NO_x Trap Materials: Pt/BaO/Al₂O₃ LNT catalysts represent a viable approach to meet the stringent NO_x emission standards being imposed on diesel engines. However, poisoning of LNTs by SO₂ represents a particular challenge for this technology. Desulfation at high temperatures (e.g., 600°C and higher) is required in order to recover the NO_x activity of LNT catalysts. Unfortunately, conventional desulfation processes result in significant irreversible Pt sintering. This is one of the critical drawbacks for commercialization of the LNT catalysts. Recent work performed by researchers in the IIC at PNNL has led to the invention of a new

desulfation strategy that minimizes irreversible Pt sintering. An invention disclosure has been filed at PNNL for this new strategy and patent paperwork is being developed.

- FCVT-Funded Science Highlighted in BNL Publication: New results identifying the nature of sulfur species on BaO-based LNT catalyst materials during sulfur removal regeneration processes were obtained in recent studies performed by researchers in the Institute for Interfacial Catalysis at PNNL. The work was recently highlighted in an on-line news report (<http://www.nsls.bnl.gov/newsroom/science/2006/07-Kim.htm>) from BNL. The experimental results suggest that the initial BaO morphology plays a crucial role in determining the extent of desulfation and the temperature at which it occurs, a result especially important in developing more sulfur-resistant LNT catalyst systems. These studies took advantage of unique facilities for performing time-resolved x-ray diffraction and x-ray absorption near edge structure measurements under realistic conditions of temperature and pressure at the National Synchrotron Light Source, BNL.

PNNL completed business development activities with MeadWestvaco in instituting a new project focused on developing a low-cost route for producing carbon fiber. The availability of a sustainable low-cost carbon fiber source, such as that proposed from lignin purification, has a significant potential to impact future lightweight vehicle construction, and aid in achieving FreedomCAR goals.

Hydrogen, Fuel Cells, and Infrastructure Technologies Program

PNNL published two journal articles and one proceedings article and gave four presentations in FY 2006 based on findings in this program.

PNNL is patenting the nickel-clad material.

PNNL aggressively pursued external collaborations that will provide expertise that complements PNNL's expertise to accelerate the development of the materials in this program.

Supported Los Alamos National Laboratory (LANL) in managing the Center of Excellence for Chemical Hydrogen Storage.

- Strong review at DOE's Annual Merit Review and at the Hydrogen Storage Tech Team meeting.
- Developed a baseline-engineering schedule for the Center through FY 2010 that meets the schedule for demonstration and validation contained within the DOE Multi-year RD&D Plan.

In concert with LANL, PNNL developed down selection and go/no-go criteria as an example of how the Center of Excellence for Chemical Hydrogen Storage should manage progress and decision-making moving ahead to Phase II work. This work was recognized as a best practice for the Storage Centers of Excellence.

The laboratory generated the first Hydrogen Storage Research Safety Plan within the Center structure. It was used as a model for nearly all the Center projects within the Hydrogen Storage

Program.

PNNL developed a scoring system for regeneration chemical routes based on a combination of DOE metrics, safety and handling concerns and processing complexity.

NOTABLE ACHIEVEMENTS

Biomass Program

PNNL continues to develop and maintain partnerships with world-class organizations resulting in both the development and deployment of biomass critical technologies.

PNNL has provided critical assistance to BP in developing its role in the President's AEI. This planning defines higher-level goals for the program over the next decade. PNNL provided input to the "30 x 30" Plan, which provides a vision and strategy for how to replace 30 percent of imported petroleum with biofuels by the year 2030. PNNL's input to these documents includes techno - economic and strategic analysis to help guide the BP as well as guidance on the infrastructure development required to realize the goals outlined. Todd Werpy's detail to the program has proven invaluable in the program's planning activities.

PNNL provided accurate and timely responses to EERE requests and proactively communicated with EERE regarding programmatic progress and emerging issues. This includes proactively working with the PMC to ensure projects remain on track and answer programmatic needs.

PNNL continued to communicate frequently with BP and PMC personnel to ensure that expectations and programmatic goals were understood and met. PNNL maintains key staff responsible for relationship management at the Program level who actively engage the Program Manager and key staff to better understand needs and provide leadership in planning activities. PNNL also issues quarterly, semi-annual, and annual reports to provide program managers and the program leadership team with an update on project status, accomplishments, and overall progress. PNNL also provides an annual overview of the work being performed at PNNL as well as the laboratory's milestones and future direction.

Building Technologies Program

PNNL achieved a close relationship with marketing partners on wireless controls and monitoring of heating, ventilation and air conditioning systems in commercial buildings and moved the product toward market use in the "HVAC Wireless Performance Monitoring & Diagnostics" project.

Although not advancing the physical sciences (as needed for solid-state lighting), PNNL has achieved the following accomplishments with the Light Right project:

- PNNL has recorded the psychological preferences of human subjects for variations of lighting design, including statistical techniques to smooth out data.
- PNNL completed the Lighting Satisfaction Survey Tool, Version 2.0. This web-based tool will assist interested parties (Light Right Partners) in assessing the acceptance of lighting

systems (and other systems in the built environment). Communication to and inclusion of key lighting industry trade groups (partners and a wider audience) is a strong point of Light Right.

Through the continuing series of Best Practices Handbooks for builders being prepared for increasing higher levels of energy efficiency in the five major climates in the United States, the BA PNNL team, in coordination with ORNL, continues to sustain building science progress and positively impact the building industry. The work of the PNNL team advances the BA research, resource development, and demonstration goals of EERE and its stakeholders.

PNNL's technology introduction groups performed a range of research management functions, including program evaluation for compact fluorescent lamps and program planning and implementation for solid-state lighting, including collaborating with industry partners.

FreedomCAR and Vehicle Technologies Program

PNNL has acted prudently in the management of its projects, delivery of key technical milestones, reports and progress review meetings through focused project management and reallocation of funds to high priority project areas. PNNL is also committed to meeting financial carryover targets.

PNNL is assuring that highly competent and nationally recognized staff is assigned to the Principal Investigator role for Automotive Lightweighting Materials projects. This is evident by our publications, invited presentations, and by participation in numerous technical societies and industry working groups.

PNNL actively participates in the FreedomCAR Automotive Lightweighting Materials program through participation in the FreedomCAR and Fuel Partnership Materials Technical Team, and provides technical assessments and planning for several thrust areas under direction of the FCVT managers. PNNL continues to work toward increasing the Lab's visibility with the automakers, as well as to elevate the visibility of the FreedomCAR program.

Hydrogen, Fuel Cells, and Infrastructure Technologies Program

PNNL elicited interest from PEMFC researchers at several automakers, including Ford and Toyota, on the clad metal bipolar plate concept.

PNNL continues to hold an exemplary safety record. Safety is a cornerstone of the PNNL storage program and PNNL has been very forthcoming with lessons learned in working with ammonia borane and ammonium borohydride. One such lesson learned involved a report posted to the storage Web site cautioning researchers on the potential for carbon scaffolds to discharge electrostatically, resulting in an ignition source for hydrogen.

PNNL participates in DOE's Storage Systems Analysis Working Group and provides valuable input to all participants.

Program Area (n)	Program obligs As of 8/31/06	Numerical Ratings of Performance Goal											
		Mission Accomplishment				Mission Accomplishment				Mission Accomplishment			
		Grade	Numerical Value	Include	Weighted	Grade	Numerical Value	Include	Weighted	Grade	Numerical Value	Include	Weighted
BP	4,326,800	A	3.9	4326800	16874520	n	0.0	0	0	A	3.9	16874520	65810628
BTP	4,750,456	A	3.9	4750456	18526778	n	0.0	0	0	A	3.9	18526778	72254436
DE	0	n	0.0	0	0	n	0.0	0	0	n	0.0	0	0
FCVT	7,849,064	A+	4.3	7849064	33750975	A+	4.3	7849064	33750975	A+	4.3	33750975	145129193
FEMP	1,815,090	n	0.0	0	0	n	0.0	0	0	n	0.0	0	0
GTP		n	0.0	0	0	n	0.0	0	0	n	0.0	0	0
HFCI	2,720,000	A	3.9	2720000	10608000	A	3.9	2720000	10608000	A	3.9	10608000	41371200
ITP	1,928,854	B+	3.3	1928854	6365218	n	0.0	0	0	B	3.3	6365218	21005220
PM	280,000	n	0.0	0	0	n	0.0	0	0	n	0.0	0	0
Solar	20,000	n	0.0	0	0	n	0.0	0	0	n	0.0	0	0
WHTP	170,000	n	0.0	0	0	n	0.0	0	0	n	0.0	0	0
WIP	3,332,500	n	0.0	0	0	n	0.0	0	0	n	0.0	0	0
Sum	27192764			21575174	86125492			10569064	44358975			86125492	345570677
Mean Weighted Office Rating -			Average		3.99		Average		4.20		Average		4.01

A

A+

A

Office of Energy Efficiency and Renewable Energy - Goal 1.0 Calculation

Office of Energy Efficiency and Renewable Energy Programs ¹	Numerical Score	Weight	Weighted Score	Overall Score
Biomass Program				
1.1 Impact	--	30%	--	
1.2 Leadership	--	30%	--	
1.3 Output	--	20%	--	
1.4 Delivery	--	20%	--	
Overall Sub Total				3.9
Building Technologies				
1.1 Impact	--	30%	--	
1.2 Leadership	--	30%	--	
1.3 Output	--	20%	--	
1.4 Delivery	--	20%	--	
Overall Sub Total				3.9
Freedom CAR and Vehicle Technologies				
1.1 Impact	--	30%	--	
1.2 Leadership	--	30%	--	
1.3 Output	--	20%	--	
1.4 Delivery	--	20%	--	
Overall Sub Total				4.3
Hydrogen Fuel Cells and Infrastructure Technologies Program				
1.1 Impact	--	30%	--	
1.2 Leadership	--	30%	--	
1.3 Output	--	20%	--	
1.4 Delivery	--	20%	--	
Overall Sub Total				3.9
Industrial Technologies Program				
1.1 Impact	--	30%	--	
1.2 Leadership	--	30%	--	
1.3 Output	--	20%	--	
1.4 Delivery	--	20%	--	
Overall Sub Total				3.3

Office of Energy Efficiency and Renewable Energy Programs	Letter Grade	Numerical Score	Funding Weight (BA)	Weighted Score	Overall Weighted Score
Biomass Program	A	3.9	20.1%	.78	
Building Technologies	A	3.9	22.0%	.86	
Freedom CAR and Vehicle Technologies	A+	4.3	36.4%	1.57	
Hydrogen Fuel Cells and Infrastructure Technologies Program	A	3.9	12.6%	.49	
Industrial Technologies Program	B+	3.3	8.9%	.29	
Performance Goal 1.0 Total					3.99

¹ The EERE evaluation was provided at the Goal level only, no scores were provided at the Objective level.

Office of Energy Efficiency and Renewable Energy - Goal 3.0 Calculation

Office of Energy Efficiency and Renewable Energy Programs ²	Numerical Score	Weight	Weighted Score	Overall Score
Biomass Program				
3.1 Effective and Efficient Stewardship	--	40%	--	
3.2 Project/Program Planning and Management	--	30%	--	
3.3 Communications and Responsiveness	--	30%	--	
Overall Total				3.9
Building Technologies				
3.1 Effective and Efficient Stewardship	--	40%	--	
3.2 Project/Program Planning and Management	--	30%	--	
3.3 Communications and Responsiveness	--	30%	--	
Overall Total				3.9
Freedom CAR and Vehicle Technologies				
3.1 Effective and Efficient Stewardship	--	40%	--	
3.2 Project/Program Planning and Management	--	30%	--	
3.3 Communications and Responsiveness	--	30%	--	
Overall Total				4.3
Hydrogen Fuel Cells and Infrastructure Technologies Program				
3.1 Effective and Efficient Stewardship	--	40%	--	
3.2 Project/Program Planning and Management	--	30%	--	
3.3 Communications and Responsiveness	--	30%	--	
Overall Total				3.9
Industrial Technologies Program				
3.1 Effective and Efficient Stewardship	--	40%	--	
3.2 Project/Program Planning and Management	--	30%	--	
3.3 Communications and Responsiveness	--	30%	--	
Overall Total				3.3

Office of Energy Efficiency and Renewable Energy Programs	Letter Grade	Numerical Score	Funding Weight (BA)	Weighted Score	Overall Weighted Score
Biomass Program	A	3.9	20.1%	.78	
Building Technologies	A	3.9	22.0%	.86	
Freedom CAR and Vehicle Technologies	A+	4.3	36.4%	1.57	
Hydrogen Fuel Cells and Infrastructure Technologies Program	A	3.9	12.6%	.49	
Industrial Technologies Program	B+	3.3	8.9%	.29	
Performance Goal 3.0 Total					3.99

² The EERE evaluation was provided at the Goal level only, no scores were provided at the Objective level.



APPENDIX 5

Office of Intelligence

From: Swift, John [mailto:John.Swift@in.doe.gov]
Sent: Friday, December 08, 2006 8:10 AM
To: Trader, Deborah E
Cc: Borgia, Stan
Subject: Evaluation

Dear Ms. Trader,

Thank you. I hope the following is a proper rendering of the immense value provided to DOE CI by the PNNL professionals.

Objective 1.1: A+/4.1

The CI program at PNNL reports concurrently to the DOE Director of Counterintelligence and the laboratory director. PNNL hosts a full counterintelligence field office, a CI cyber analytical center, and a CI data recovery center at the PNNL site. Additionally, PNNL provides the contractor workforce that conducts all CI polygraph examinations within DOE, operating out of locations in Albuquerque and Oak Ridge. PNNL also provides the cadre for the CI inspections program through consulting arrangements with the contract personnel who, together, compose our inspection team. In every aspect of their management functions, PNNL has set a standard of excellence. Top notch performance.

Objective 1.2: A/4.0

Cannot comment on leadership in the S&T community, however, we continue to be quite satisfied with the leadership exhibited by the PNNL team in its support to the CI mission of DOE. As also mentioned elsewhere, PNNL is a leader without peer in the counterintelligence realm. Our CI office, manned by PNNL employees, has been singled out for its excellence by our demanding inspection program and is a benchmark against which our other CI offices gauge themselves. PNNL's leadership in the area of analysis of the foreign cyber threat is probably as good as and, perhaps, better than any other such analytical entity in the government. Our polygraph program accomplishes a prodigious workload, on time and under the highest standards of professional excellence. Our emergency data recovery capability, led by PNNL, functions brilliantly and transparently, providing us a critical backup capability not previously available. Our inspection program has been recognized by the National Counterintelligence Executive and by congressional staffers as the model against which other CI inspection ventures should be modeled. All this takes leadership of the highest calibre. PNNL has provided that leadership, coupled with an enthusiasm and "can do" attitude that virtually ensures that any task is not only accomplished but accomplished completely and ahead of schedule.

Objective 1.3: do not feel qualified to comment

Objective 1.4: A+/4.3

Cannot comment on the effective delivery of S&T, however, PNNL has done an excellent job in multiple CI work areas providing timely, quality personnel and mission support. PNNL's delivery of counterintelligence support spans the broadest spectrum of any laboratory in the CI complex and encompasses the provision of polygraph services, conduct of CI investigations and operations, foreign traveler briefings and debriefings, foreign visitor and assignment host briefings and debriefings, intricate liaison relationships with the FBI and other federal and local intelligence and law enforcement agencies, foreign threat awareness training to the entire PNNL population, cyber threat analysis, installation and maintenance of a highly sophisticated suite of sensors designed to protect DOE sites from foreign cyber intrusions, provision of inspection services that cover the entirety of the CI mission area.

We regularly rely on the demonstrated expertise of the PNNL CI professionals in special CI projects. In each case their advice and assistance has been timely and on point.

Objective 3.1: A+/4.3

Cannot comment on stewardship of scientific capabilities. In the CI area, however, the excellence of the PNNL CI program has been recognized in its most recent internal inspection, where the CI office was rated "excellent." The inspection evaluates a number of specific CI mission areas as well as overall executive and program management, in each of which the PNNL did quite well and, in many respects, sets the standard for our other offices. The effectiveness of the CI program, I believe, should be factored into your ultimate determination of effective and efficient stewardship of scientific capabilities insofar as the mission of counterintelligence is to protect that selfsame scientific capability from foreign intelligence collection. The quality of the PNNL CI program not only serves to protect the science and technology resident at PNNL, it also protects the rest of the complex through our polygraph and inspection components.

Objective 3.2: A/4.0

We are quite satisfied with the effective and efficient management and planning support provided by PNNL to our CI programs. We rely upon PNNL to manage the largest number of discrete counterintelligence programs and initiatives of any laboratory within the DOE complex. PNNL provides the cadre and internal management structure for our entire inspection program, which is charged with examining the degree to which each of our 23 CI offices complies with legal and regulatory requirements governing the conduct of CI activities. In every aspect of this--including the professional expertise of the inspection cadre and the administrative infrastructure needed to arrange and conduct each of our inspections--the PNNL team has been without peer. They absolutely set a standard of excellence unmatched elsewhere in the COE complex.

PNNL manages our emergency data recovery capability for the entire CI structure within DOE. This important function has just come fully on line during this rating period and has performed in superb fashion, to the point that, on one instance when our main servers suffered a catastrophic failure, we were automatically shunted to our PNNL backup servers without us perceiving that the transfer was taking place. We have one of the finest electronic emergency backup systems in existence--largely thanks to the hard work and expertise of the PNNL team.

Our polygraph program is managed by PNNL and, on average, conducts in excess of 2000 counterintelligence and security polygraph examinations each year. The professional calibre of our polygraph staff--situated remotely from PNNL in Albuquerque and Oak Ridge--is without equal in the polygraph community. Our program is closely tied to the Department of Defense Polygraph Institute, which is the federal entity that sets standards and provides training for the entire federal polygraph community. The relationships that we have established over the years with DODPI bear strong testimony to the professional expertise of our superb PNNL polygraph team.

The Operational Analysis Center (OAC), our cyber analytical center, is run by PNNL. Its unique capabilities provide DOE and its outlying sites an immense capability to protect sites from penetration by foreign computer intrusions and to analyze foreign cyber threats. To give you an idea of the excellence of this small group of highly specialized analysts, a senior leader of the US Computer Emergency Response Team, commenting during a recent visit to the OAC, stated that the OAC capability was more mature and advanced than virtually any other cyber analytical center in the US. High praise from one who is positioned to know. We certainly second that opinion.

Finally, and by no means least, the PNNL counterintelligence office is recognized as one of the absolute trend-setters in our CI program. Recognized in their most recent inspection as an "excellent" program, this small group of counterintelligence professionals has established several best practices that we, in turn, have employed throughout our CI complex, to the betterment of the entire program.

The PNNL efforts have been superb in every respect.

Objective 3.3: A/4.0

Excellent communication and customer service. Very responsive at all times. Very "reachable." On several occasions we have called upon PNNL's CI expertise for special project assistance. In each case, PNNL has responded quickly and with top quality advice and expertise. In one case, PNNL provided subject matter expertise that was central to our development of cogent performance measures for our CI enterprise. These performance measures have been employed in our recent 2008 budget submission and will form the basis upon which the Director of National Intelligence and the national intelligence community gauge the effectiveness of our CI activities.

Across the spectrum of each of the discrete programs that PNNL manages for CI, PNNL has established a reputation for rapid response with quality information.

John E. Swift, III
Assistant Deputy Director
Counterintelligence Directorate
202-586-1701

Figure 1 is a line graph showing the percentage of respondents who believe that the use of force is justified in various circumstances. The x-axis represents the percentage of respondents who believe that the use of force is justified in the circumstances. The y-axis represents the percentage of respondents who believe that the use of force is justified in the circumstances. The graph shows a positive correlation between the two variables.



Department of Energy

Washington, DC 20585

December 12, 2006

MEMORANDUM

TO: Paul W. Kruger
Pacific Northwest Site Office

FROM: *for* Jeffrey D. Jarrett *Thomas D. Shope*
Assistant Secretary, Office of Fossil Energy

SUBJECT: Department of Energy (DOE) Evaluation of Battelle's Performance in
Managing and Operating the Pacific Northwest National Laboratory
(PNNL) For FY 2006.

Attached please find the annual evaluations that you requested, which were conducted by FE project managers for R&D performed by PNNL during FY 2006. The evaluations were conducted against the Performance Objectives as they relate to PNNL accomplishments that advance the FE program objectives. The narrative comments that were received from each project's reviewer are also attached. The comment format is keyed to that of your evaluation form (e.g., Achievements and Deficiencies).

Should you need any further information, please contact Victor Der at 301-903-2700.

Attachments

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DEC 21 2006



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DOE-PNSOLCC

Score Sheet

PROGRAM OFFICE EVALUATION OF PNNL'S FY 2006 RESEARCH

Evaluator: Udaya Rao Date: 10/26/06

Project Title: Fossil Energy Advanced Research Materials Program Route Symbol: NETL

Program: AR Materials Program B&R and FY06 Funding: AA1510100, \$350,000

(Please provide a numerical score for each of the following objectives. A score of at least 3.1 to 3.4 should be assigned if expectations are being met. Circle the score for item 1.3 & 1.4, which are Pass/Fail. A detailed description of the goals and objectives, as well as criteria for scoring them is in the Explanation of Rating System attachment.)

Goal/Objective	Score
PERFORMANCE GOAL 1.0: Provide for Efficient and Effective Mission Accomplishment	
1.1 Science and technology results provide meaningful <i>impact</i> on the field (0 to 4.3)	4.2
1.2 Provide quality leadership in science and technology (<i>leadership</i>) (0 to 4.3)	4.1
1.3 Provide and sustain science and technology outputs that advance program objectives and goals (<i>output</i>) (circle)	Pass
1.4 Provide for effective delivery of science and technology (<i>delivery</i>) (circle)	Pass
PERFORMANCE GOAL 2.0 (Not applicable to FE)	
PERFORMANCE GOAL 3.0: Provide effective and efficient science and technology research project/program management	
3.1 Provide effective and efficient stewardship of scientific capabilities and program vision (0 to 4.3)	4.2
3.2 Provide effective and efficient science and technology project/program planning and management (0 to 4.3)	4.1
3.3 Provide efficient and effective communication and responsiveness to customer needs (0 to 4.3)	4.2

Narrative Support for Score

Please provide narrative information to support your ratings for each objective, using the form below:

Evaluator: Udaya Rao Date: 10/25/06

Project Title: Solid State Electrolyte Systems Route Symbol: NETL

Program: AR Materials Program B&R and FY06 Funding: AA1510100, \$350,000

Comments Applying to Objective 1.1

Achievements (by priority, 1-most significant)

1. A critical milestone was achieved when a sealing technique was developed in this project for metal-ceramic joining. Several types of inorganic membranes are being developed for hydrogen or oxygen separation, including porous alumina, transition metal oxide perovskites, and zirconia. One of the key challenges in developing solid-state membrane based gas separation systems is in hermetically joining the membrane to the metallic gas manifold system. To address this issue a new metal-ceramic joining concept referred to as air brazing has been developed. In addition, the project made considerable progress in understanding the underlying mechanisms responsible for wetting between these novel filler metals and ceramic substrates.

2.

3.

Etc.

Deficiencies (by priority, 1-most significant)

1.

2.

3.

Etc.

Comments Applying to Objective 1.2

Achievements (by priority, 1-most significant)

1. PNNL researchers have achieved a long sought-after goal of developing a method of ceramic-to-metal brazing specifically for high temperature membrane materials. Referred to as air brazing, the technique has advantages over traditional active metal brazing in two important ways: (1) it utilizes a liquid-phase oxide-noble metal melt as the basis for joining and therefore exhibits high-temperature oxidation resistance and (2) the process is conducted directly in air without the use of fluxes and/or inert cover gases. The project has focused on proof-of-principle development and testing of the Ag-CuO system, for example demonstrating the use of air brazing in joining a variety of ceramic membranes and heat resistant alloys of interest to the FE program, as well as examining the resulting strengths and microstructures of these joints in the as-joined condition; after long-term, high-temperature exposure testing; and upon thermal cycling.

2.

3.

Etc.

Deficiencies (by priority, 1-most significant)

1.

2.

3.

Etc.

Comments Applying to Objective 1.3

Achievements (by priority, 1-most significant)

1.

2.

3.

Etc.

Deficiencies (by priority, 1-most significant)

1.

2.

3.

Etc.

Comments Applying to Objective 1.4

Achievements (by priority, 1-most significant)

1.

2.

3.

Etc.

Deficiencies (by priority, 1-most significant)

1.

2.

3.

Etc.

Comments Applying to Objective 3.1

Achievements (by priority, 1-most significant)

1. Has provided leadership in addressing sealing issues for gas separation devices and solid oxide fuel cells. Have teamed effectively with researchers at Washington State University in developing the new metal-ceramic joining concept referred to as air brazing. The PI has also supported the SBIR program by reviewing proposals in this area and identifying promising concepts in sealing. In addition, the team has presented several papers reviewing recent progress in understanding the underlying mechanisms responsible for wetting between novel filler metals and ceramic substrates.

2.

3.

Etc.

Deficiencies (by priority, 1-most significant)

1.

2.

3.

Etc.

Comments Applying to Objective 3.2

Achievements (by priority, 1-most significant)

1.

2.

3.

Etc.

Deficiencies (by priority, 1-most significant)

1.

2.

3.

Etc.

Comments Applying to Objective 3.3

Achievements (by priority, 1-most significant)

1.

2.

3.

Etc.

Deficiencies (by priority, 1-most significant)

1.

2.

3.

Etc.

ATTACHMENT 2
PROGRAM OFFICE EVALUATION OF UT-BATTELLE'S FY 2006 RESEARCH

Evaluator: Heino Beckert

Date: 23 Oct 2006

Project Title: Renewable Hydrogen Production by a Biophotolytic Process

Route Symbol: _____

Program: AR Power Bioprocessing Program (BP)

B&R and FY Funding: AA1520350

(Please provide a numerical score for each of the following objectives. A score of at least 3.1 to 3.4 should be assigned if expectations are being met. Circle the score for item 1.3 & 1.4, which are Pass/Fail. A detailed description of the goals and objectives, as well as criteria for scoring them is in the Explanation of Rating System attachment.)

Goal/Objective	Score
PERFORMANCE GOAL 1.0: Provide for Efficient and Effective Mission Accomplishment	
1.1 Science and technology results provide meaningful <i>impact</i> on the field (0 to 4.3)	4.0
1.2 Provide quality leadership in science and technology (<i>leadership</i>) (0 to 4.3)	4.0
1.3 Provide and sustain science and technology outputs that advance program objectives and goals (<i>output</i>) (circle)	Pass
1.4 Provide for effective delivery of science and technology (<i>delivery</i>) (circle)	Pass
PERFORMANCE GOAL 2.0 (Not applicable to FE)	
PERFORMANCE GOAL 3.0: Provide effective and efficient science and technology research project/program management	
3.1 Provide effective and efficient stewardship of scientific capabilities and program vision (0 to 4.3)	4.0
3.2 Provide effective and efficient science and technology project/program planning and management (0 to 4.3)	4.0
3.3 Provide efficient and effective communication and responsiveness to customer needs (0 to 4.3)	4.0

ATTACHMENT 3

Please provide narrative information to support your ratings for each objective, using the form below:

Evaluator: Heino Beckert

Date: 23 Oct 2006

Project Title: Renewable Hydrogen Production by a Biophotolytic Process

Route Symbol: _____

Program: AR Power Bioprocessing Program (BP)

B&R and FY06 Funding: AA1520350 _____

Comments Applying to Objective 1.1

Achievements (by priority, 1-most significant)

1. This project has been ongoing for only six months; consequently, results are preliminary and results and achievements by the P.I. are necessarily tentative. However, preliminary research results indicate that this project has considerable potential for succeeding in demonstrating and optimizing an indirect biophotolysis process for the biological production of hydrogen.
2. The P.I. has developed and calibrated a new and improved gas analyzing method using a gas chromatograph equipped with a thermal conductivity detector and employing helium as a carrier gas to increase sensitivity in measuring small amounts of hydrogen gas.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 1.2

Achievements (by priority, 1-most significant)

1. This project represents a novel approach for the bio-production of hydrogen. This process employed by the P.I., namely an indirect biophotolytic process for first fixing CO₂ and producing oxygen with subsequent production of hydrogen from stored carbohydrates clearly represents an important new step in biohydrogen production.
2. With this project, the P.I. has demonstrated a willingness to undertake a unique scientific challenge in the area of biohydrogen production.
3. The P.I. has not yet, but will during a later phase in the project; enter into collaboration with a known phycologist to better determine various physiological aspects of the most promising algal strains for biohydrogen production within the P.I.'s experimental regime.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 1.3

Achievements (by priority, 1-most significant)

1. Despite the recent initiation of this project, the P.I. has given a paper based on his current research at a Biotechnology Workshop at EPRI in Palo Alto, CA. His paper's title was "Carbon Capture: Microalgal Mass

Cultures for Greenhouse Gas Abatement and Biofuels Production”.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 1.4

Achievements (by priority, 1-most significant)

1. The P.I. has submitted, according to contractual requirements, regular and timely Progress Reports; including required milestones. The P.I. has always met his Milestones since the initiation of this project.
2. The P.I.'s responsiveness to questions by DOE is excellent. He is always willing to explain research results and data as compiled in his reports. He is easy to talk to and communicates his ideas very well.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 3.1

Achievements (by priority, 1-most significant)

1. The P.I. has articulated his scientific vision in a presentation regarding his current project at a recent Biotechnology workshop.
2. The P.I. has developed core competencies and scientific ideas and concepts for this new project. His ideas/concepts have been well-defined and articulated in the FWP for this project.
3. The project is only 6 months into its course and planning for workshops and seminars on this effort are premature at this time.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 3.2

Achievements (by priority, 1-most significant)

1. The high quality of the P.I.'s R&D has been demonstrated amply during the conduct of previous projects funded by DOE and managed by me. Based on his results and his met Milestones so far, I have no doubt that the P.I. will continue to produce valid scientific results and thus make a significant contribution to the DOE/NETL Bio Program.

2. So far, this project has not suffered from any significant delay or scheduling problem because of technical or scientific miscalculations or mistakes. This project is on track.
3. The project has not yet progressed far enough for me to respond to the other questions.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 3.3

Achievements (by priority, 1-most significant)

1. The P.I. communicates very well with me, the COR, and the Technology Manager, via phone conversations and e-messages. The P.I. is responsive to requests by NETL. He is quick to answer questions regarding project data and developments as they occur. I have complete confidence in the P.I.'s candor in discussing his project and his results.
2. Because the P.I. is the only contact person for me on this project, I deal exclusively with him; no other personnel is involved. I have never had any difficulties in talking with him or requesting information from him. He is very responsive and eager to provide any information requested of him.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

OFFICE OF FOSSIL ENERGY YEAR-END PERFORMANCE EVALUATION OF
THE PACIFIC NORTHWEST NATIONAL LABORATORY (PNNL)
FOR FISCAL YEAR (FY) 2006

Two Field Work Proposals (FWPs) are evaluated and rated: 1) FWP40552 Solid State Energy Conversion Alliance (SECA) Core Technology Program, and 2) FWP44036 High Temperature Electrochemistry Center. Both FWPs support the Office of Fossil Energy Coal and Power Systems program.

Objectives:

1.1 Science and Technology Results Provide Meaningful Impact on the Field
Score: 4.0, A

Under the Solid State Energy Conversion Alliance (SECA) Core Technology Program, PNNL has conducted substantial solid oxide fuel cell research. This research was very relevant to Industry Teams.

Advanced Cell Materials

- Evaluation of Cr-poisoning of cathodes
- Assessment of mixed-conducting cathode stability
- Development of protective coatings for alloy interconnects
- Dual atmosphere corrosion processes and interconnects development
- Development of "refractory" glass seals with CTE match to other stack components
- Completed thermal stability study of candidate refractory sealing glasses in a SOFC environment

Modeling and Simulation

- Development of a methodology to assess glass-ceramic seal failure
- Development of an approach for modeling on-cell reformation of methane
- Completed an integrated modeling/experimental framework to predict the life of SOFC interconnect materials

Fuel Processing

- Completed direct on-anode methane steam reforming studies on standard Ni-YSZ and modified Ni-based anode formulations in powder form
- Completed TGA and TEM studies that show the formation of carbon over conventional Ni-YSZ anode structures at S/C at or below 2/1

PNNL has also conducted substantial research in high temperature electrochemistry. The High Temperature Electrochemistry Center provides crosscutting, multidisciplinary research that supports FE's mission to improve the efficiency and minimize the environmental consequences of electrical power generation from fossil fuels, with an emphasis on topics relevant to SOFCs operating on coal-derived fuels. This research is expected to lead to increased power density, enhanced lifetime, and lowered operating temperatures for solid oxide fuel cells and steam electrolyzers, and new concepts in energy storage. PNNL works together with their primary subcontractor Montana State University and the University of Florida.

- Reversible fuel cells offer a potentially attractive means of energy storage, allowing hydrogen fuel to be produced during periods of excess grid capacity that can be converted back to electricity during periods of greater need. Factors controlling the performance of reversible solid oxide fuel cells are being investigated, and alternative materials are being developed as a means of enhancing throughput and efficiency. The area-specific resistance of full-sized anode-supported reversible fuel cells was shown to be consistently higher in the electrolysis than fuel cell mode, largely attributable to the performance of the air electrode. An alternative composite fuel electrode consisting of doped strontium titanate and doped ceria provides lower polarization losses than standard nickel/zirconia under conditions of electrolysis, and is less susceptible to degradation.

- Copper-substituted lanthanum strontium ferrites have been shown to be exceptionally active as the air electrode in a reversible solid oxide fuel cell, though perform similarly to lanthanum strontium ferrite at temperatures greater than ~800°C. Copper-substituted lanthanum strontium ferrites show high mixed electronic and ionic conductivity, which enhances electrocatalytic activity through extension of the dimensions of the triple phase boundary. A complete description of oxygen non-stoichiometry, electron carrier density, electrical and ionic conductivity, thermal expansion behavior, and compositional ranges of single phase behavior has been developed for this system. Copper-substituted ferrites are expected to be best suited for intermediate or low temperature operation.
- A new n-type thermoelectric material consisting of substituted indium oxide has been developed that exhibits a thermoelectric yield more than three times higher than any other known bulk oxide of that type. These materials show exceptionally high, metal-like electrical conductivity – greater than 1200 S/cm at 1000°C – and a Seebeck coefficient greater than 110 μV/K at that temperature. Unlike traditional thermoelectric materials, such oxides are compatible with the high temperatures typically produced in fossil energy conversion systems. Thermoelectric generators constructed using these new materials would allow waste heat from fuel cells and other high temperature devices to be converted to electricity.
- In collaboration with the University of Missouri-Rolla, anomalous shrinkage behavior of porous Sr-doped lanthanum manganite ($\text{La}_{1-x}\text{Sr}_x\text{MnO}_{3+\delta}$ or LSM, where $x = 0.0$ to 0.4) has been studied as a function of thermal cycling, oxygen partial pressure, and Sr dopant concentration. Densification has been observed at temperatures hundreds of degrees lower than the sintering temperature. LSM is an unusual material in that there exists excess oxygen in the lattice in air, actually expressed as an increased number of metal vacancies. That excess oxygen disappears under conditions possible with cathodic polarization, at about 10^{-3} atm oxygen partial pressure. When cycled between high and low oxygen partial pressures, defects are either created or annihilated to maintain a Schottky equilibrium, resulting in the formation of microscopic voids. These voids can coalesce, eventually leading to densification. This research is pertinent to both the electrochemical and thermal cycling of fuel cells that utilize manganite-based oxygen electrodes.

Interactions of hydrogen sulfide with nickel/zirconia and cerate/titanate composite SOFC have been investigated in concentrations up to 1000 ppm H_2S . Exchange currents determined by electrochemical impedance spectroscopy in button cell tests revealed a rapid de-activation of thin nickel/zirconia electrodes when exposed to hydrogen sulfide concentrations of 10 ppm, whereas the ceramic anode showed only a modest loss of activity under identical conditions. De-activation by sulfur was more easily reversed for the ceramic anode than nickel/zirconia. If the modest electronic conductivity of cerate/titanate anode compositions can be overcome, results indicate that these materials may hold promise for enabling SOFC operation in gasified coal with limited cleanup.

1.2 Provide Quality Leadership in Science and Technology

Score: 4.0, A

PNNL personnel are leading the efforts in solid oxide fuel cell development and high temperature electrochemistry. They interact regularly with SECA participants. PNNL maintain relations with universities, national laboratories and SECA industry team members to disseminate results in the form of quarterly, annual, topical reports, and technical paper. PNNL attracts world class scientists needed for the ensured success of the SECA program.

1.3 Provide and sustain Science and Technology Outputs that Advance Program Objectives and Goals

Score: 4.3, Pass

PNNL regularly participates in progress reviews and peer reviews throughout the year. Based on these reviews they make necessary changes to the direction of the research and follows through. Their research

successes are highlighted in Objective 1.1. Their quantity of research, publications, and presentations are sufficient enough to warrant a passing grade.

1.4 Provide for Effective Delivery of Science and Technology
Score: 4.3, Pass

PNNL met all FE quarterly indicators for these projects on time and within the budget.

FY06 Quarterly Indicators for SECA Core Technology Program

Q1	Evaluate seal creep during thermal cycling and long term operation	Met
Q2	Report on effect of percent on-cell reformation on thermal and electrochemical performance	Met
Q3	Complete thermal stability of refractory sealing glass in a SOFC environment	Met
Q4	Report initial findings on the effects of carbon activity on the oxidation and corrosion of selected interconnect candidate alloys	Met

FY06 Quarterly Indicators for HiTEC Project

Q1	Demonstrate reversible fuel cell operation in a single cell stack	Met
Q2	Complete an assessment of reversibility of ferrite, cobaltite, and manganite air electrodes, relevant to reversible fuel cell operation	Met
Q3	Develop an n-type mixed metal oxide composition exhibiting a figure of merit greater than 0.6 at 800 C	Met
Q4	Assess how the performance of nickel based fuel cell anodes are affected by exposure to phosphorus compounds at concentrations similar to those found in coal gas	Met

HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Fossil Energy (FE)					
1.1 Impact	A	4.0	30%	1.20	
1.2 Leadership	A	4.0	30%	1.20	
1.3 Output	Pass	4.3	20%	0.86	
1.4 Delivery	Pass	4.3	20%	0.86	
Overall FE Total					4.12, A+

Objectives:

3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision
Score: 4.1, A+

PNNL has developed and maintained the core competencies needed to successfully accomplish their objectives. PNNL has the labs, equipment, and researchers they need to meet SECA expectations. The arrangement among PNNL, Montana State University, and University of Florida in the HiTEC program is a

good example of how PNNL partners with others to enhance their core competencies. PNNL is recognized as a leader in solid oxide fuel cell research and high temperature electrochemistry research.

3.2 Provide Effective and Efficient Science and Technology Project/Program Planning and Management

Score: 4.1, A+

PNNL has an effective program management structure for the SECA Core FWP.

- Coordination of Core Program: PNNL provides technical status updates to SECA program participants through SECA Annual Workshops and Peer Review Meetings. Quarterly, annual and topical reports are prepared and provided to SECA program participants.
- Identified and prioritized PNNL technology development plans and communicated them to SECA industry teams and NETL.
- Participation in national meetings: PNNL has made many technical presentations (invited, plenary and topical) at various national technical society (ASM, ACerSoc, ECS, TMS etc.) meetings and has taken the lead to organize national SOFC events.
- Publications in refereed scientific journals: PNNL has published numerous technical papers summarizing the technology status and technical progress.

In addition, PNNL is responsive to changing needs of FE. For example, when NETL identified a need to evaluate Cr-poisoning of cathodes, they refocused their work in response to these needs.

In addition, PNNL has an effective program management structure for the HiTEC FWP.

- Coordination of Program: PNNL provides technical status updates through workshops and meetings.
- Participation in national meetings: PNNL has made many technical presentations at various national technical society meetings.
- Publications in refereed scientific journals: PNNL has published numerous technical papers summarizing the technology status and technical progress.

In addition, PNNL is responsive to the changing needs of FE. For example, NETL identified a need this year to make the HiTEC work more focused on SECA Cost Reduction and Coal Based Systems programs and the HiTEC FWP was revised to address those needs.

3.3 Provide Efficient and Effective Communications and Responsiveness to Customer Needs

Score: 4.1, A+

PNNL is responsive to NETL and regularly communicates to NETL via email and phone, and they participate in weekly teleconference meetings with NETL personnel (example Cell Materials discussion among Jeff Stevenson and Lane Wilson). They can be counted on to respond to various questions or issues as they arise.

HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Fossil Energy (FE)					
3.1 Effective and Efficient Stewardship	A+	4.1	40%	1.64	
3.2 Project/Program Planning and Management	A+	4.1	30%	1.23	
3.3 Communications and Responsiveness	A+	4.1	30%	1.23	
Overall FE Total					4.1, A+

**Office of Fossil Energy Year-End Performance Evaluation of Battelle
for the Management and Operation of the PNNL for FY 2006**

FWP No. B&R
40265 AA3010000

Title
Enhancing Carbon Sequestration and Reclamation of
Degraded Lands with Fossil-Fuel Combustion By-Products

Contractor Name
Battelle Memorial
Institute/PNNL

Funding Amount (\$)
119,000

HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Fossil Energy (FE)					
1.1 Impact	A	4.0	30%	1.2	
1.2 Leadership	A	4.0	30%	1.2	
1.3 Output	P	4.3	20%	0.9	
1.4 Delivery	P	4.3	20%	0.9	
Overall FE Total					4.1

Table 1.1 - 1.0 Program Office Performance Goal Score Development

HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Fossil Energy (FE)					
3.1 Effective and Efficient Stewardship	A	4.0	40%	1.6	
3.2 Project/Program Planning and Management	A	4.0	30%	1.2	
3.3 Communications and Responsiveness	A	4.0	30%	1.2	
Overall FE Total					4.0

Table 3.1 - 3.0 Program Office Performance Goal Score Development

Brief Narrative Justifying the Score/Grade Assigned (Description Highlighting Significant Strengths and/or Weaknesses as they Relate to the Objectives)

Goal 1 - Provide for Efficient and Effective Mission Accomplishment

Objective 1.1 - Science and Technology Results Provide Meaningful Impact on the Field

Justification for Score: - PNNL demonstrated timely, high-quality, and high-impact research that enhanced carbon sequestration and reclamation of degraded lands with fossil-fuel combustion by-products.

Objective 1.2 Provide Quality Leadership in Science and Technology

Justification for Score: - PNNL continues to provide leadership and solutions to carbon sequestration technology issues.

Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Justification for Score: - PNNL provided innovative science and technology ideas that will advance DOE-FE's carbon sequestration program objectives and goals.

Objective 1.4 - Provide for Effective Delivery of Science and Technology

Justification for Score: - PNNL delivered program outcomes and objectives in accordance with work plans and submitted deliverables on time and within budget.

Goal 2 - Provide Effective and Efficient Science & Technology Research Project/Program Management

Objective 3.1 - Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Justification for Score: - While maintaining core competencies in carbon sequestration, during FY 2006 PNNL developed new capabilities and attracted and retained highly qualified staff.

Objective 3.2 - Provide Effective and Efficient Science and Technology Project/Program Planning and Management

Justification for Score: - PNNL provided program planning to meet FE and industry needs for innovative solutions that advanced the development of carbon sequestration and reclamation of degraded lands.

Objective 3.3 - Provide Effective and Efficient Communications & Responsiveness to Customers Needs

Justification for Score: - PNNL provided accurate and timely responses to FE requests and proactively communicated with FE regarding carbon sequestration program progress.

**Office of Fossil Energy Year-End Performance Evaluation of Battelle
for the Management and Operation of the PNNL for FY 2006**

FWP No. B&R
44360 AA3010000

Title
Fossil Energy Technology Strategy

Contractor Name
Battelle Memorial
Institute/PNNL

Funding Amount (\$)
250,000

HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Fossil Energy (FE)					
1.1 Impact	A	4.0	30%	1.2	
1.2 Leadership	A	4.0	30%	1.2	
1.3 Output	P	4.3	20%	0.9	
1.4 Delivery	P	4.3	20%	0.9	
Overall FE Total					4.1

Table 1.1 - 1.0 Program Office Performance Goal Score Development

HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Fossil Energy (FE)					
3.1 Effective and Efficient Stewardship	A	4.0	40%	1.6	
3.2 Project/Program Planning and Management	A	4.0	30%	1.2	
3.3 Communications and Responsiveness	A	4.0	30%	1.2	
Overall FE Total					4.0

Table 3.1 - 3.0 Program Office Performance Goal Score Development

Brief Narrative Justifying the Score/Grade Assigned (Description Highlighting Significant Strengths and/or Weaknesses as they Relate to the Objectives)

Goal 1 - Provide for Efficient and Effective Mission Accomplishment

Objective 1.1 - Science and Technology Results Provide Meaningful Impact on the Field

Justification for Score - PNNL demonstrated timely, high-quality, and high-impact research that advanced the development of the Fossil Energy Technology Strategy.

Objective 1.2 Provide Quality Leadership in Science and Technology

Justification for Score - PNNL provided the leadership and solutions needed to successfully develop the Fossil Energy Technology Strategy.

Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Justification for Score - PNNL provided innovative science and technology ideas needed to advance the Fossil Energy Technology Strategy.

Objective 1.4 - Provide for Effective Delivery of Science and Technology

Justification for Score - PNNL delivered program outcomes and objectives in accordance with work plans for the Fossil Energy Technology Strategy and submitted deliverables on time and within budget.

Goal 2 - Provide Effective and Efficient Science & Technology Research Project/Program Management

Objective 3.1 - Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Justification for Score - While maintaining core competencies in carbon sequestration technologies, during FY 2006 PNNL developed new capabilities and retained highly qualified staff.

Objective 3.2 - Provide Effective and Efficient Science and Technology Project/Program Planning and Management

Justification for Score - PNNL provided program planning needed in the development of the Fossil Energy Technology Strategy.

Objective 3.3 - Provide Effective and Efficient Communications & Responsiveness to Customers Needs

Justification for Score - PNNL provided accurate and timely responses to FE requests concerning the Fossil Energy Technology Strategy and proactively communicated with FE regarding programmatic progress and emerging issues.

**Office of Fossil Energy Year-End Performance Evaluation of Battelle
for the Management and Operation of the PNNL for FY 2006**

FWP No. B&R
45502 AA3010000

Title
Sequestration of CO2 in Basalt Formations

Contractor Name
Battelle Memorial
Institute/PNNL

Funding Amount (\$)
250,000

HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Fossil Energy (FE)					
1.1 Impact	A	4.0	30%	1.2	
1.2 Leadership	A	4.0	30%	1.2	
1.3 Output	P	4.3	20%	0.9	
1.4 Delivery	P	4.3	20%	0.9	
Overall FE Total					4.1

Table 1.1 - 1.0 Program Office Performance Goal Score Development

HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Fossil Energy (FE)					
3.1 Effective and Efficient Stewardship	A	4.0	40%	1.6	
3.2 Project/Program Planning and Management	A	4.0	30%	1.2	
3.3 Communications and Responsiveness	A	4.0	30%	1.2	
Overall FE Total					4.0

Table 3.1 - 3.0 Program Office Performance Goal Score Development

Brief Narrative Justifying the Score/Grade Assigned (Description Highlighting Significant Strengths and/or Weaknesses as they Relate to the Objectives)

Goal 1 - Provide for Efficient and Effective Mission Accomplishment

Objective 1.1 - Science and Technology Results Provide Meaningful Impact on the Field

Justification for Score - PNNL demonstrated timely, high-quality, and high-impact research that advanced the science of sequestration of CO2 in basalt formations.

Objective 1.2 Provide Quality Leadership in Science and Technology

Justification for Score - PNNL provided the leadership necessary to develop the science and technology for sequestration of CO2 in basalt formations.

Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Justification for Score - PNNL provided innovative science and technology ideas that will advance sequestration of CO2 in basalt formations.

Objective 1.4 - Provide for Effective Delivery of Science and Technology

Justification for Score - PNNL delivered program outcomes and objectives in accordance with work plans for the sequestration of CO2 in basalt formations and submitted deliverables on time and within budget.

Goal 2 - Provide Effective and Efficient Science & Technology Research Project/Program Management

Objective 3.1 - Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Justification for Score - While maintaining core competencies in carbon sequestration, during FY 2006 PNNL developed new capabilities in sequestration of CO2 in basalt formations and retained highly qualified staff.

Objective 3.2 - Provide Effective and Efficient Science and Technology Project/Program Planning and Management

Justification for Score - PNNL provided program planning to meet FE needs for innovative solutions that advanced the sequestration of CO2 in basalt formations.

Objective 3.3 - Provide Effective and Efficient Communications & Responsiveness to Customers Needs

Justification for Score - PNNL provided accurate and timely responses to FE requests concerning sequestration of CO2 in basalt formations and proactively communicated with FE regarding programmatic progress and emerging issues.

**Office of Fossil Energy Year-End Performance Evaluation of Battelle
for the Management and Operation of the PNNL for FY 2006**

FWP No. B&R
46379 AA3010000

Title
Zero Emissions Research & Technology Center

Contractor Name
Battelle Memorial
Institute/PNNL

Funding Amount (\$)
750,000

HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Fossil Energy (FE)					
1.1 Impact	A	4.0	30%	1.2	
1.2 Leadership	A	4.0	30%	1.2	
1.3 Output	P	4.3	20%	0.9	
1.4 Delivery	P	4.3	20%	0.9	
Overall FE Total					4.1

Table 1.1 - 1.0 Program Office Performance Goal Score Development

HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Fossil Energy (FE)					
3.1 Effective and Efficient Stewardship	A	4.0	40%	1.6	
3.2 Project/Program Planning and Management	A	4.0	30%	1.2	
3.3 Communications and Responsiveness	A	4.0	30%	1.2	
Overall FE Total					4.0

Table 3.1 - 3.0 Program Office Performance Goal Score Development

Brief Narrative Justifying the Score/Grade Assigned (Description Highlighting Significant Strengths and/or Weaknesses as they Relate to the Objectives)

Goal 1 - Provide for Efficient and Effective Mission Accomplishment

Objective 1.1 - Science and Technology Results Provide Meaningful Impact on the Field

Justification for Score - PNNL demonstrated timely, high-quality, and high-impact research that advanced the Zero Emissions Research & Technology Center.

Objective 1.2 Provide Quality Leadership in Science and Technology

Justification for Score - PNNL provided leadership and solutions that advanced the efforts of the Zero Emissions Research & Technology Center.

Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Justification for Score - PNNL provided innovative science and technology ideas that advanced the Zero Emissions Research & Technology Center.

Objective 1.4 - Provide for Effective Delivery of Science and Technology

Justification for Score - PNNL delivered program outcomes and objectives in accordance with work plans for the Zero Emissions Research & Technology Center and submitted deliverables on time and within budget.

Goal 2 - Provide Effective and Efficient Science & Technology Research Project/Program Management

Objective 3.1 - Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Justification for Score - While maintaining core competencies in carbon sequestration and other related technologies, during FY 2006 PNNL developed new capabilities and retained highly qualified staff.

Objective 3.2 - Provide Effective and Efficient Science and Technology Project/Program Planning and Management

Justification for Score - PNNL provided program planning to meet FE needs for innovative solutions that advanced the Zero Emissions Research & Technology Center.

Objective 3.3 - Provide Effective and Efficient Communications & Responsiveness to Customers Needs

Justification for Score - PNNL provided accurate and timely responses to FE requests concerning the Zero Emissions Research & Technology Center and proactively communicated with FE regarding programmatic progress and emerging issues.

**Office of Fossil Energy Year-End Performance Evaluation of Battelle
for the Management and Operation of the PNNL for FY 2006**

FWP No. B&R
47172 AA3010000

Title
Development of Science-Based Permitting Guidance for
Geological Sequestration of CO₂ in Deep Saline Aquifers
Based on Modeling and Risk Assessment

Contractor Name
Battelle Memorial
Institute/PNNL

Funding Amount (\$)
22,541

HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Fossil Energy (FE)					
1.1 Impact	A	4.0	30%	1.2	
1.2 Leadership	A	4.0	30%	1.2	
1.3 Output	P	4.3	20%	0.9	
1.4 Delivery	P	4.3	20%	0.9	
Overall FE Total					4.1

Table 1.1 - 1.0 Program Office Performance Goal Score Development

HQ Program Office	Letter Grade	Numerical Score	Weight	Weighted Score	Overall Score
Office of Fossil Energy (FE)					
3.1 Effective and Efficient Stewardship	A	4.0	40%	1.6	
3.2 Project/Program Planning and Management	A	4.0	30%	1.2	
3.3 Communications and Responsiveness	A	4.0	30%	1.2	
Overall FE Total					4.0

Table 3.1 - 3.0 Program Office Performance Goal Score Development

Brief Narrative Justifying the Score/Grade Assigned (Description Highlighting Significant Strengths and/or Weaknesses as they Relate to the Objectives)

Goal 1 - Provide for Efficient and Effective Mission Accomplishment

Objective 1.1 - Science and Technology Results Provide Meaningful Impact on the Field

Justification for Score - PNNL demonstrated timely, high-quality, and high-impact research that advanced the development of science-based permitting guidance for geological sequestration of CO₂ in deep saline aquifers.

Objective 1.2 Provide Quality Leadership in Science and Technology

Justification for Score - PNNL provided leadership and solutions for the development of modeling and risk assessment needed to develop science-based permitting guidance for geological sequestration.

Objective 1.3 Provide and Sustain Science and Technology Outputs that Advance Program Objectives and Goals

Justification for Score - PNNL provided innovative science and technology ideas needed to develop permitting guidance for geological sequestration.

Objective 1.4 - Provide for Effective Delivery of Science and Technology

Justification for Score - PNNL delivered program outcomes and objectives in accordance with work plans for developing permitting guidance for geological sequestration in deep saline formations and submitted deliverables on time and within budget.

Goal 2 - Provide Effective and Efficient Science & Technology Research Project/Program Management

Objective 3.1 - Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision

Justification for Score - While maintaining core competencies, during FY 2006 PNNL developed new capabilities and retained highly qualified staff needed to achieve the objective.

Objective 3.2 - Provide Effective and Efficient Science and Technology Project/Program Planning and Management

Justification for Score - PNNL provided program planning to meet FE needs for innovative solutions that advanced the development of science-based permitting guidance for geological sequestration of CO₂ in deep saline aquifers.

Objective 3.3 - Provide Effective and Efficient Communications & Responsiveness to Customers Needs

Justification for Score - PNNL provided accurate and timely responses to FE requests concerning development of permitting guidance and proactively communicated with FE regarding programmatic progress and emerging issues.

Score Sheet

PROGRAM OFFICE EVALUATION OF UT-BATTELLE'S FY 2006 RESEARCH

Evaluator: Kelly Rose Date: October 25th, 2006

Project Title: Characterization of Natural Hydrate Bearing Cores Route Symbol: FWP45133 (?)

Program: Methane Hydrates B&R and FY06 Funding: 1610261

(Please provide a numerical score for each of the following objectives. A score of at least 3.1 to 3.4 should be assigned if expectations are being met. Circle the score for item 1.3 & 1.4, which are Pass/Fail. A detailed description of the goals and objectives, as well as criteria for scoring them is in the Explanation of Rating System attachment.

Goal/Objective	Score
PERFORMANCE GOAL 1.0: Provide for Efficient and Effective Mission Accomplishment	
1.1 Science and technology results provide meaningful <i>impact</i> on the field (0 to 4.3)	3.8
1.2 Provide quality leadership in science and technology (<i>leadership</i>) (0 to 4.3)	3.6
1.3 Provide and sustain science and technology outputs that advance program objectives and goals (<i>output</i>) (circle)	Pass (4.3)
1.4 Provide for effective delivery of science and technology (<i>delivery</i>) (circle)	Pass (4.3)
PERFORMANCE GOAL 2.0 (Not applicable to FE)	
PERFORMANCE GOAL 3.0: Provide effective and efficient science and technology research project/program management	
3.1 Provide effective and efficient stewardship of scientific capabilities and program vision (0 to 4.3)	3.5
3.2 Provide effective and efficient science and technology project/program planning and management (0 to 4.3)	3.6
3.3 Provide efficient and effective communication and responsiveness to customer needs (0 to 4.3)	3.8

Narrative Support for Score

Please provide narrative information to support your ratings for each objective, using the form below:

Evaluator: Kelly Rose

Date: October 25, 2006

Project Title: Characterization of Natural Hydrate Bearing Core Samples Route Symbol: FWP 45133 (?)

Program: Methane Hydrates B&R and FY06 Funding: 1610261

Comments Applying to Objective 1.1: Science and technology results provide meaningful (impact) on the field

Achievements (by priority, 1-most significant)

1. IR Camera – The performer adapted and demonstrated the particular utility of this equipment for the quick and accurate identification of hydrate bearing sediments in both field and laboratory settings. This tool has proven uniquely important during field programs for the rapid identification of hydrate bearing core samples thereby ensuring scientists are provided with high quality, natural samples to study and analyze. The performer continues to modify this tool and enhance the application of this technology, including recent work using the IR images to provide quantitative estimates of hydrate concentrations from core samples scanned with the tool in the field.
2. Methane Hydrate Reservoir Simulator Code Comparison Study – PNNL and their STOMP-HYD code were one of the first groups to join and participate in the NETL/DOE led MH Code Comparison Study. This study is ongoing and PNNL continues to be an active participant.
3. Environmental Scanning Electron Microscope (ESEM) – PNNL researchers applied ESEM to provide among the very first visual images of the formation and decomposition of gas hydrate crystals within sediment samples. They also used a mass spectrometer in conjunction with the ESEM to record the rate of gas hydrate decomposition by tracking gases evolved from the sample. These studies will aid in understanding the microscopic details of gas hydrates in porous media to explain why laboratory-grown gas hydrates do not behave like gas hydrates produced in nature.
4. Resonant Ultrasound Spectroscopy (RUS) - PNNL has applied RUS with the goal of providing an additional, highly sensitive method for non-destructively detecting and quantifying the amount of gas hydrate in core samples. Research has shown that the resonant response is highly sensitive to the presence and mode of occurrence of gas hydrates in the pore space of the sample. This discovery has enabled researchers to conduct quantitative measurements of gas hydrate stability in the core samples. The results suggest that classical data and thermodynamic models on gas hydrate stability poorly capture gas hydrate behavior in real sediments.

Deficiencies (by priority, 1-most significant)

1. While the RUS and ESEM techniques/tools show innovation and promise, DOE would like to see the RUS and ESEM experimental findings integrated into practical tools for hydrate analysis (either in the numerical simulation of field or laboratory data). The procedures (RUS in particular) need to be better validated by experimentation on known standard materials, although this is recognized as being difficult. ESEM images, while intriguing, but it is not clear that they have been shown to provide usable insights.

Comments Applying to Objective 1.2: Provide quality leadership in science and technology (leadership)

Achievements (by priority, 1-most significant)

1. PNNL has been the leader in the development and utilization of IR imagining and interpretation capabilities in the field. These efforts were proven once again in PNNLs support to the recent expedition in India, in which the value of

real-time IR data collection was extended beyond its previous realm as a qualitative indicator of hydrate presence to a potentially highly-sensitive quantitative tool in certain settings.

2. PNNLs support to the code comparison effort has helped that effort immensely in becoming the key ongoing activity in the field of hydrate reservoir simulation.

Deficiencies (by priority, 1-most significant)

1. PNNL is generally viewed as highly capable with access to a talented team. However, the PNNL team has not yet been successful in integrating its capabilities in modeling, field data acquisition, and laboratory work into a focused effort. The RUS work, in particular, needs to be better integrated into the existing knowledge base of experimentation using ultrasound.

Comments Applying to Objective 1.3: Provide and sustain science and technology outputs that advance program objectives and goals (output)

Achievements (by priority, 1-most significant)

1. PNNL has been successful in the application of their IR camera and scanning techniques on all major methane hydrate field projects over the past 3 years. During this summer's 2006 India research expedition the team utilized the data from this tool to produce a new method for estimating gas hydrate concentrations in core samples. This supports the program's goals of advancing field as well as laboratory analysis and quantification techniques.

2. 14 publications in 8 different technical journals since 2001. One of these journal publications met a milestone of the FWP. In addition, PNNL had one full length article published in the Winter 2005 *Fire-in-the-Ice* newsletter and has contributed content to other *FITI* newsletter articles.

3. The research team has given 7 presentations at 6 different conferences since 2002: Including, the American Chemical Society, American Geophysical Union Meeting, Mallik 2002 Gas Hydrate Production Research Well Symposium, Whistler, BC, Workshop on the Mallik 5L-38 Gas Hydrate Research Well, The American Association of Petroleum Geologists Hedberg Research Conference, 229th American Chemical Society National Meeting, and the World Congress on Ultrasonics/Ultrasonics International, Beijing, China.

Deficiencies (by priority, 1-most significant)

1. PNNL has published and presented some results of their work, but integration of the data into practical applications in the programs field, modeling, or laboratory analysis procedures is needed. More peer reviewed publications describing PNNLs IR, ESEM and RUS experiments are also desired.

Comments Applying to Objective 1.4: Provide for effective delivery of science and technology (delivery)

Achievements (by priority, 1-most significant)

1. As stated in comments related to Objective 1.1 (there is no impact without delivery) PNNL has reliably delivered quality science and technology support to the conduct of field expeditions through their application and development of IR scanning and analysis technology.

2. PNNL has been among the most responsive and engaged partners in the critical code comparison study.

Deficiencies (by priority, 1-most significant)

1. The experimental results of the ESEM and RUS work might be compromised by an inability of the group to produce validated and repeatable lab data, and to fully integrate that information into the existing body of knowledge

regarding the response of sediment samples to ultrasonic energy. The results of the experimentation are not yet to impact hydrate simulation or the translation between experimental and field data.

Comments Applying to Objective 3.1: Provide effective and efficient stewardship of scientific capabilities and Program vision

Achievements (by priority, 1-most significant)

1. PNNL has clearly been an effective and efficient steward of the IR technology, as noted in comments above.
2. PNNL recognizes the importance of understanding the differences between laboratory and field samples and has investigated several innovative avenues to gain insight into the issue. PNNL also recognizes the need to develop capabilities in numerical simulation as well as experimentation.
3. PNNL has participated in joint planning workshops such as the Inter-Laboratory Hydrate Workshop 2006, Hosted by the Colorado School of Mines, Golden, CO.

Deficiencies (by priority, 1-most significant)

1. As discussed in comments above, although PNNL has developed several new innovative tools/techniques for the study of methane hydrates (RUS and ESEM), they could do more to validate the results of their work in these areas and to integrate the results with downstream applications.

Comments Applying to Objective 3.2: Provide effective and efficient science and technology project/program planning and management

Achievements (by priority, 1-most significant)

1. PNNL has routinely delivered field work proposals and modifications that are clear and on time.
2. Project results are generally delivered on time and at expected cost.
2. PNNL provides experienced and capable researchers to conduct the proposed work.

Deficiencies (by priority, 1-most significant)

1. The progression of the experimental work is not always fully clear. The quality of R&D to date has met expectations however, the performer needs to build upon the preliminary experimental results from the ESME and RUS studies to substantiate and place these results within the context of the existing knowledge base for methane hydrates.

Comments Applying to Objective 3.3: Provide efficient and effective communication and responsiveness to customer needs

Achievements (by priority, 1-most significant)

1. Very good communication with both Dr. Long and Dr. McGrail. Both have been very responsive to DOE requests for information and both provide regular updates via informal monthly reports and reporting of significant accomplishments or issues as they occur.
2. All project milestones to date have been met on schedule with the exception of the code comparison study publication which was delayed because of changes/delays in leadership at NETL/DOE of that study.

3. The relevant point of contact for information pertaining to this work is clear and well established.

Deficiencies (by priority, 1-most significant)

n/a

SCORE SHEET

PROGRAM OFFICE EVALUATION OF UT-BATTELLE'S FY 2006 RESEARCH

Evaluator: Joseph Giove

Date: 1 Nov 2006

Project Title: Support for New Coal Based Power Plants

Route Symbol: FE-22

Program: Clean Energy Systems

B&R and FY06 Funding: AA1510100, AA2015000, AA2045000, AA2060010, AA2530000, AK2006000, AY050000, AY050000

(Please provide a numerical score for each of the following objectives. A score of at least 3.1 to 3.4 should be assigned if expectations are being met. Circle the score for item 1.3 & 1.4, which are Pass/Fail. A detailed description of the goals and objectives, as well as criteria for scoring them is in the Explanation of Rating System attachment.)

Goal/Objective	Score
PERFORMANCE GOAL 1.0: Provide for Efficient and Effective Mission Accomplishment	
1.1 Science and technology results provide meaningful <i>impact</i> on the field (0 to 4.3)	4. 1
1.2 Provide quality leadership in science and technology (<i>leadership</i>) (0 to 4.3)	4. 1
1.3 Provide and sustain science and technology outputs that advance program objectives and goals (<i>output</i>) (circle)	Pass
1.4 Provide for effective delivery of science and technology (<i>delivery</i>) (circle)	Pass
PERFORMANCE GOAL 2.0 (Not applicable to FE)	
PERFORMANCE GOAL 3.0: Provide effective and efficient science and technology research project/program management	
3.1 Provide effective and efficient stewardship of scientific capabilities and program vision (0 to 4.3)	4. 1
3.2 Provide effective and efficient science and technology project/program planning and management (0 to 4.3)	4. 1
3.3 Provide efficient and effective communication and responsiveness to customer needs (0 to 4.3)	4. 1

NARRATIVE SUPPORT

Please provide narrative information to support your ratings for each objective, using the form below:

Evaluator: Joseph Giove

Date: 1 Nov 2006

Project Title: Support for New Coal Based Power Plants

Route Symbol: FE-22

Program: Clean Energy Systems

B&R and FY06 Funding: AA1510100, AA2015000, AA2045000, AA2060010, AA2530000, AK2006000, AY050000, AY050000

Comments Applying to Objective 1.1

Achievements (by priority, 1-most significant)

1. There are many options for new coal based power plants. Many things determine which type of plant, where to place it, and the ability to meet environmental regulations. This program was developed to support the decision making process on critical issues associated with coal based power plants. Some of the significant achievements have been: Expediting New Coal Power Plant Construction Custom versus Standardized Plant Designs, Coal Supply Delivery Disruption Affects on Electric Generation, and Regional Regulatory Planning to Expedite Coal Power Plant Construction.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 1.2

Achievements (by priority, 1-most significant)

1. The achievement of the objectives of this program requires a broad and deep knowledge of existing and future power plants as well as their operation. To achieve the goals of this program requires a large degree of technology leadership. The staff on this program has demonstrated exceptional technical skill, leadership qualities, and a broad base of knowledge.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 1.3

Achievements (by priority, 1-most significant)

1. The technology output from this program has been continual and of high quality. The breadth of the projects, from a working knowledge of railroad systems to coal mining and power plants themselves requires a large amount of teamwork and sharing and integrating of knowledge. This team has performed well.
2. Program objectives have been consistently met.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 1.4

Achievements (by priority, 1-most significant)

1. The program staff is in frequent contact with FE and is current on program needs and requirements and any changes in direction that are required. FE is kept up to speed on program progress and emerging findings.
2. The program has submitted contractually required progress reports in a timely manner and has met all milestones in a timely manner.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 3.1

Achievements (by priority, 1-most significant)

1. The results of this program have enabled FE to make important decisions from a more informed position. The technology base developed on this program is key to advanced energy conversion devices of the future as well as existing facilities. The staff on this program represent key capabilities that are important to FE. They have been excellent stewards of the technology and have provided vision for the future.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 3.2

Achievements (by priority, 1-most significant)

1. The program is well managed and has met all FE demands including milestones, information, vision, and technical advice. The staff is of high quality and possesses a broad base of knowledge.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 3.3

Achievements (by priority, 1-most significant)

1. The program staff is in frequent contact with FE staff and is very responsive to FE's needs and requirements. The communications are timely and helpful.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

SCORE SHEET

PROGRAM OFFICE EVALUATION OF UT-BATTELLE'S FY 2006 RESEARCH

Evaluator: Joseph Giove

Date: 1 Nov 2006

Project Title: Regulatory Analysis on Emissions from Power Plants

Route Symbol: FE-22

Program: Clean Energy Systems

B&R and FY06 Funding: AA1520350, AA1520700, AA1525050, AA1530010, AA2020000, AA2025200, AE1000000, AE1500000

(Please provide a numerical score for each of the following objectives. A score of at least 3.1 to 3.4 should be assigned if expectations are being met. Circle the score for item 1.3 & 1.4, which are Pass/Fail. A detailed description of the goals and objectives, as well as criteria for scoring them is in the Explanation of Rating System attachment.

Goal/Objective	Score
PERFORMANCE GOAL 1.0: Provide for Efficient and Effective Mission Accomplishment	
1.1 Science and technology results provide meaningful <i>impact</i> on the field (0 to 4.3)	4. 1
1.2 Provide quality leadership in science and technology (<i>leadership</i>) (0 to 4.3)	4. 1
1.3 Provide and sustain science and technology outputs that advance program objectives and goals (<i>output</i>) (circle)	Pass
1.4 Provide for effective delivery of science and technology (<i>delivery</i>) (circle)	Pass
PERFORMANCE GOAL 2.0 (Not applicable to FE)	
PERFORMANCE GOAL 3.0: Provide effective and efficient science and technology research project/program management	
3.1 Provide effective and efficient stewardship of scientific capabilities and program vision (0 to 4.3)	4. 1
3.2 Provide effective and efficient science and technology project/program planning and management (0 to 4.3)	4. 1
3.3 Provide efficient and effective communication and responsiveness to customer needs (0 to 4.3)	4. 1

NARRATIVE SUPPORT

Please provide narrative information to support your ratings for each objective, using the form below:

Evaluator: Joseph Giove

Date: 1 Nov 2006

Project Title: Regulatory Analysis on Emissions from Power Plants

Route Symbol: FE-22

Program: Clean Energy Systems

B&R and FY06 Funding: AA1520350, AA1520700, AA1525050,
AA1530010, AA2020000, AA2025200, AE1000000, AE1500000

Comments Applying to Objective 1.1

Achievements (by priority, 1-most significant)

1. In order to continue using coal as a primary source of electric power generation, more environmentally benign ways of utilizing coal must be developed (including the development of clean advanced energy conversion devices). However, in order to properly develop the energy conversion devices of the future, one must be certain that regulatory requirements will be met and anticipate requirements for the future. This project evaluates emissions from power plants with respect to regulatory requirements now and in the future. It requires a combination of knowing the regulatory environment and the technology that is both current and planned for in the future. This is a highly significant program which enables critical decisions to be made.
2. The analysis from this program help shape the future of advanced energy conversion programs as well as the path forward for existing power generators.

Deficiencies (by priority, 1-most significant)

1. Here are no deficiencies I can determine.

Comments Applying to Objective 1.2

Achievements (by priority, 1-most significant)

1. This project requires a broad base of knowledge in both power generation and emission control, as well as environmental policy and what drives it. In order for these analysis and reports to be useful and have an impact, the technical credibility of the involved staff have to be extremely high.
2. This project also requires "team players" and a commitment to put forth an analysis that is defensible, which the staff on this project have demonstrated.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 1.3

Achievements (by priority, 1-most significant)

1. This program is continually pushing the technology envelope and advancing our understanding of environmental mitigation options. The results of this program enable options for future power generation to be considered in a realistic manner.
2. Risk assessments for various options are enabled by this program and the highly skilled staff.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 1.4

Achievements (by priority, 1-most significant)

1. Every deliverable and milestone has been submitted on time and has been of high quality. The staff has a frequent dialog with FE and continually adjusts the program to the needs of FE. This program and staff are very responsive.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 3.1

Achievements (by priority, 1-most significant)

1. The project has submitted timely and quality progress reports, including required milestones. All milestones have been met since the program began.
2. The program is responsive to questions from FE.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 3.2

Achievements (by priority, 1-most significant)

1. This program requires a broad base of skills and a team approach. The fact that the program has been highly creative and successful is proof that the program staff is effective, efficient, and well managed.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 3.3

Achievements (by priority, 1-most significant)

1. The program staff communicates often and effectively with FE headquarters and has been responsive to the needs of FE. They are quick to answer questions and have the depth of knowledge to adequately explain the details and rationale.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

SCORE SHEET

PROGRAM OFFICE EVALUATION OF UT-BATTELLE'S FY 2006 RESEARCH

Evaluator: Joseph Giove

Date: 1 Nov 2006

Project Title: Clean Utilization of Coal for Advanced Energy Conversion

Route Symbol: FE-22

Program: Clean Energy Systems

B&R and FY06 Funding: AA1040000, AA1520151, AA1520300,
AA1520450, AA152015000, AA2530000, AY050000

(Please provide a numerical score for each of the following objectives. A score of at least 3.1 to 3.4 should be assigned if expectations are being met. Circle the score for item 1.3 & 1.4, which are Pass/Fail. A detailed description of the goals and objectives, as well as criteria for scoring them is in the Explanation of Rating System attachment.)

Goal/Objective	Score
PERFORMANCE GOAL 1.0: Provide for Efficient and Effective Mission Accomplishment	
1.1 Science and technology results provide meaningful <i>impact</i> on the field (0 to 4.3)	4. 1
1.2 Provide quality leadership in science and technology (<i>leadership</i>) (0 to 4.3)	4. 1
1.3 Provide and sustain science and technology outputs that advance program objectives and goals (<i>output</i>) (circle)	Pass
1.4 Provide for effective delivery of science and technology (<i>delivery</i>) (circle)	Pass
PERFORMANCE GOAL 2.0 (Not applicable to FE)	
PERFORMANCE GOAL 3.0: Provide effective and efficient science and technology research project/program management	
3.1 Provide effective and efficient stewardship of scientific capabilities and program vision (0 to 4.3)	4. 1
3.2 Provide effective and efficient science and technology project/program planning and management (0 to 4.3)	4. 1
3.3 Provide efficient and effective communication and responsiveness to customer needs (0 to 4.3)	4. 1

NARRATIVE SUPPORT

Please provide narrative information to support your ratings for each objective, using the form below:

Evaluator: Joseph Giove

Date: 1 Nov 2006

Project Title: Clean Utilization of Coal for Advanced Energy Conversion

Route Symbol: FE-22

Program: Clean Energy Systems

B&R and FY06 Funding: AA1040000, AA1520151, AA1520300,
AA1520450, AA152015000, AA2530000, AY050000

Comments Applying to Objective 1.1

Achievements (by priority, 1-most significant)

1. This program is designed to give support to FE Headquarters in the area of clean coal utilization for advanced energy conversion. The program has resulted in several studies and reports which support decision making in FE Headquarters. The most significant achievement has been the development and beta testing of the Interactive Energy Computer Model which enables the objective determination of the cost, environmental, and energy savings advantages of advanced energy conversion devices.
2. An operations manual has been developed so that others can utilize the Interactive Energy Computer Model.
3. A risk assessment has been made on the probability of success of zero emission initiatives that are being considered by FE. A report has been submitted.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 1.2

Achievements (by priority, 1-most significant)

1. The modeling, assessments, and analysis that have been made on this project have paved the way for critical decisions on project priorities, budget defenses, and funding levels. Some of the analysis and modeling techniques used were unique and innovative and demonstrated technical leadership in the Advanced Energy Conversion area.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 1.3

Achievements (by priority, 1-most significant)

1. The development and beta testing of the Interactive Energy Computer Model, its operating manual, and the several Risk Assessments have enabled FE to better meet their objectives of developing cost effective and functional advanced energy conversion devices.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 1.4

Achievements (by priority, 1-most significant)

1. All contractually agreed to requirements, including monthly reports, have been met. All milestones have been met since the inception of the program.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 3.1

Achievements (by priority, 1-most significant)

1. This program has resulted in the utilization of technical expertise and facilities to develop tools and assessments that have guided FE's decision making in the area of advanced energy conversion. These capabilities and models will be the base for future advancements in advanced energy conversion.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 3.2

Achievements (by priority, 1-most significant)

1. The broad based knowledge required to do the modeling and risk assessment of complex energy conversion systems and greenhouse gas mitigation strategies is large. The fact that this program has met every milestone on time (so far) is a good indication of the quality and commitment of the staff.
2. The fact that the results from this program play a key role in decision making at FE is also indicative of the quality, management skill, and technical expertise of the staff.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Comments Applying to Objective 3.3

Achievements (by priority, 1-most significant)

1. The staff on this project communicates and responds in a timely fashion to Headquarter's needs. The dialog is on a regular basis and serves to stimulate thought and new ideas. This is a very effective program.

Deficiencies (by priority, 1-most significant)

1. There are no deficiencies I can determine.

Performance Evaluation Baseline Funding	PNNL New BA	Sub Total New BA	Budget Weight
1 Fossil Energy Advanced Research Mat'l Program AA1510100	350,000.00	350,000.00	2.13%
2 Renewable H2 Production by a Biophotolytic Process AA1520350	287,238.00	287,238.00	1.75%
3 Solid State Energy Conversion Alliance Core Tech Program FWP 40552 AA2530000	5,736,000.00	11,586,000.00	70.49%
High Temperature Electrochemistry Center FWP 44036 AA2525000	5,850,000.00		
4 Enhanced Carbon Sequestration and Reclamation of Degraded Lands AA3010000	1,391,541.00	1,391,541.00	8.46%
5 Characterization of Nat'l Hydrate Bearing Cores FWP 45133 AB0535000	450,000.00	450,000.00	2.74%
6 Support for New Coal Based Power Plants AA1510100 Balance from above	99,006.00	970,784.00	5.91%
AA2015000	528,994.00		
AA2045000	101,000.00		
AA2060010	18,000.00		
AA2530000 duplication			
AK2006000	100,000.00		
AY050000 JA AY050000	123,784.00		
AY050000 duplication			
7 Clean Utilization of Coal for Advanced Energy Conversion AA1040000	53,000.00	1,008,216.00	6.13%
AA1520151	129,000.00		
AA1520300	74,000.00		
AA1520450	265,000.00		
AA152015000 duplication			
AA2530000 duplication			
AY050000 JL AY050000	487,216.00		
8 Regulatory Analysis of Emissions from Power Plants AA1520350 duplication		392,762.00	2.39%
AA152700	58,000.00		
AA1525050	44,625.00		
AA1530010	41,622.00		
AA2020000	12,000.00		
AA2025200	95,000.00		
AE1000000	132,113.00		
AE1500000	9,402.00		
	\$ 16,436,541.00	16,436,541.00	100.00%

Office of Fossil Energy - Goal 1.0 Calculation

Office of Fossil Energy Programs	Numerical Score	Weight	Weighted Score	Overall Score
Advanced Research Materials Program				
1.1 Impact	4.2	30%	1.26	
1.2 Leadership	4.1	30%	1.23	
1.3 Output	4.3	20%	0.86	
1.4 Delivery	4.3	20%	0.86	
Overall Sub Total				4.21
Renewable H2 Production by a Biophotolytic Process				
1.1 Impact	4.0	30%	1.2	
1.2 Leadership	4.0	30%	1.2	
1.3 Output	4.3	20%	0.86	
1.4 Delivery	4.3	20%	0.86	
Overall Sub Total				4.12
SECA core Technology Program and High Temperature Electrochemistry Center				
1.1 Impact	4.0	30%	1.2	
1.2 Leadership	4.0	30%	1.2	
1.3 Output	4.3	20%	0.86	
1.4 Delivery	4.3	20%	0.86	
Overall Sub Total				4.12
Enhanced Carbon Sequestration and Reclamation Program				
1.1 Impact	4.0	30%	1.2	
1.2 Leadership	4.0	30%	1.2	
1.3 Output	4.3	20%	0.86	
1.4 Delivery	4.3	20%	0.86	
Overall Sub Total				4.12
Characterization of Nat'l Hydrate Bearing Cores				
1.1 Impact	3.8	30%	1.14	
1.2 Leadership	3.6	30%	1.08	
1.3 Output	4.3	20%	0.86	
1.4 Delivery	4.3	20%	0.86	
Overall Sub Total				3.94
Support for New Coal Based Power Plants				
1.1 Impact	4.1	30%	1.23	
1.2 Leadership	4.1	30%	1.23	
1.3 Output	4.3	20%	0.86	
1.4 Delivery	4.3	20%	0.86	
Overall Sub Total				4.18
Clean Utilization of Coal for Advanced Energy Conversion				
1.1 Impact	4.1	30%	1.23	
1.2 Leadership	4.1	30%	1.23	
1.3 Output	4.3	20%	0.86	
1.4 Delivery	4.3	20%	0.86	
Overall Sub Total				4.18

Regulatory Analysis of Emissions from Power Plants				
1.1 Impact	4.1	30%	1.23	
1.2 Leadership	4.1	30%	1.23	
1.3 Output	4.3	20%	0.86	
1.4 Delivery	4.3	20%	0.86	
Overall Sub Total				4.18

Office of Fossil Energy Programs	Letter Grade	Numerical Score	Funding Weight (BA)	Weighted Score	Overall Weighted Score
Advanced Research Materials Program	A+	4.21	2.13%	0.09	
Renewable H2 Production by a Biophotolytic Process	A+	4.12	1.75%	0.07	
SECA core Technology Program and High Temperature Electrochemistry Center	A+	4.12	70.49%	2.9	
Enhanced Carbon Sequestration and Reclamation Program	A+	4.12	8.46%	0.35	
Characterization of Nat'l Hydrate Bearing Cores	A	3.94	2.74%	0.11	
Support for New Coal Based Power Plants	A+	4.18	5.91%	0.25	
Clean Utilization of Coal for Advanced Energy Conversion	A+	4.18	6.13%	0.26	
Regulatory Analysis of Emissions from Power Plants	A+	4.18	2.39%	0.1	
Performance Goal 1.0 Total					4.13

Office of Fossil Energy - Goal 3.0 Calculation

Office of Fossil Energy Programs	Numerical Score	Weight	Weighted Score	Overall Score
Advanced Research Materials Program				
3.1 Effective and Efficient Stewardship	4.2	40%	1.68	
3.2 Project/Program Planning and Management	4.1	30%	1.23	
3.3 Communications and Responsiveness	4.2	30%	1.26	
Overall Total				4.17
Renewable H2 Production by a Biophotolytic Process				
3.1 Effective and Efficient Stewardship	4.0	40%	1.6	
3.2 Project/Program Planning and Management	4.0	30%	1.2	
3.3 Communications and Responsiveness	4.0	30%	1.2	
Overall Total				4.0
SECA core Technology Program and High Temperature Electrochemistry Center				
3.1 Effective and Efficient Stewardship	4.1	40%	1.64	
3.2 Project/Program Planning and Management	4.1	30%	1.23	
3.3 Communications and Responsiveness	4.1	30%	1.23	
Overall Total				4.1
Enhanced Carbon Sequestration and Reclamation Program				
3.1 Effective and Efficient Stewardship	4.0	40%	1.6	
3.2 Project/Program Planning and Management	4.0	30%	1.2	
3.3 Communications and Responsiveness	4.0	30%	1.2	
Overall Total				4.0
Characterization of Nat'l Hydrate Bearing Cores				
3.1 Effective and Efficient Stewardship	3.5	40%	1.4	
3.2 Project/Program Planning and Management	3.6	30%	1.08	
3.3 Communications and Responsiveness	3.8	30%	1.14	
Overall Total				3.62
Support for New Coal Based Power Plants				
3.1 Effective and Efficient Stewardship	4.1	40%	1.64	
3.2 Project/Program Planning and Management	4.1	30%	1.23	
3.3 Communications and Responsiveness	4.1	30%	1.23	
				4.1
Clean Utilization of Coal for Advanced Energy Conversion				
3.1 Effective and Efficient Stewardship	4.1	40%	1.64	
3.2 Project/Program Planning and Management	4.1	30%	1.23	
3.3 Communications and Responsiveness	4.1	30%	1.23	
Overall Total				4.1

Regulatory Analysis of Emissions from Power Plants				
3.1 Effective and Efficient Stewardship	4.1	40%	1.64	
3.2 Project/Program Planning and Management	4.1	30%	1.23	
3.3 Communications and Responsiveness	4.1	30%	1.23	
Overall Total				4.1

Office of Fossil Energy Programs	Letter Grade	Numerical Score	Funding Weight (BA)	Weighted Score	Overall Weighted Score
Advanced Research Materials Program	A+	4.17	2.13%	0.09	
Renewable H2 Production by a Biophotolytic Process	A	4.0	1.75%	0.07	
SECA core Technology Program and High Temperature Electrochemistry Center	A+	4.1	70.49%	2.89	
Enhanced Carbon Sequestration and Reclamation Program	A	4.0	8.46%	0.34	
Characterization of Nat'l Hydrate Bearing Cores	A-	3.62	2.74%	0.1	
Support for New Coal Based Power Plants	A+	4.1	5.91%	0.24	
Clean Utilization of Coal for Advanced Energy Conversion	A+	4.1	6.13%	0.25	
Regulatory Analysis of Emissions from Power Plants	A+	4.1	2.39%	0.1	
Performance Goal 3.0 Total					4.08



APPENDIX 7

Office of Environmental Management

memorandum

DATE: December 15, 2006

REPLY
TO
ATTN OF: EM-20 (Alchowiak, 202-586-4629)

SUBJECT: The Office of Environmental Management's Year-End Performance Evaluation of Battelle for the Management and Operation of the Pacific Northwest National Laboratory for FY2006

TO: Julie Erickson, Acting Manager

One of the strategic goals for the Department is to complete cleanup of the contaminated nuclear weapons manufacturing and testing sites across the United States. A key strategy to achieve this goal is to leverage science and technology to directly address the specific, applied needs for cleanup and closure.

We need the National Laboratories to help in providing innovation to achieve our cleanup goal safely and successfully. The National Laboratories have the opportunity to bring innovation, especially in the areas of basic and applied research, to address the issues in the most efficient and effective manner while ensuring the safety of the Department's employees and the U.S. citizens.

We want to challenge Pacific Northwest National Laboratory to continue to build a partnership to accelerate innovation and create transformational solutions for these difficult problems. We owe it to the communities we live in and the country to accomplish this important mission in the most efficient and effective manner.

Pacific Northwest National Laboratory (PNNL) supports the Office of Environmental Management (EM) at the following four EM sites: Richland (RL), Office of River Protection (ORP), Idaho (ID), and Savannah River (SR). The overall rating is based on input for the four sites and their specific comments are attached. A summary of the ratings for each objective is as follows:

Objective 1.1: **Rating is A- or 3.7**

Objective 1.2: **Rating is A- or 3.7**

Objective 1.3: **Not Applicable to EM**

Objective 1.4: **Rating is Pass or 4.3**

Objective 3.1: **Rating is A- or 3.7**

Objective 3.2: **Rating is B+ or 3.4**

Objective 3.3: **Rating is B+ or 3.4**

Objective 1.1 - Science and Technology Results Provide Meaningful Impact on the Field: Rating is A- or 3.7

For EM, the success of the research is measured by the mission-related research and its potential impact on the EM mission. PNNL expertise in the areas of geology and seismology are helping EM to reduce some of the uncertainties associated with the seismic issues for Hanford Waste Treatment Plant. Their research in the high level waste area is providing information regarding waste form acceptability, waste forms acceptability, and expected long term performance especially as it relates to bulk vitrification.

Objective 1.2 - Provide Quality Leadership in Science and Technology: Rating is A- or 3.7

As stated above, EM needs for research is mission related. PNNL did provide a Chief Process Engineer and technical support to the WTP and did provide technical leadership on the Hanford groundwater and vadose zone integration. However, at the Hanford site, PNNL should have provided more proactive technical expertise especially in the area of the groundwater and vadose zone integration efforts based on current and past research in this area over the past 10 years.

Objective 1.4 - Provide for Effective Delivery of Science and Technology: Rating is Pass or 4.3

Although PNNL has had some issues in meeting goals and milestones, they have put corrective actions into place. Delivery of technically sound results on time is critical for EM decision making to address technical uncertainties for EM high priority projects. EM has rated this as a Pass for FY2006, however, it will be critical in FY2007 for PNNL to meet its commitments to EM on time while still providing scientifically sound results.

Objective 3.1 – Provide Effective and Efficient Stewardship of Scientific Capabilities and Program Vision: Rating is A- or 3.7

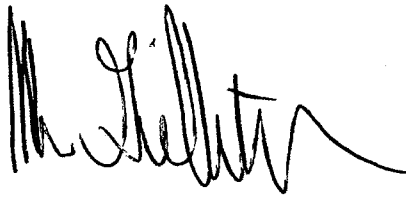
In FY2006, PNNL has provided effective joint planning with SC and EM in the subsurface science area. EM is concerned about PNNL's ability to attract and retain qualified staff in the areas needed to address high level waste areas such as waste form performance, actinide chemistry, etc.

Objective 3.2 – Provide Effective and Efficient Science and Technology Project/ Program Planning and Management: Rating is B+ or 3.4

In FY2006, PNNL provided EM with technical expertise in areas of high level waste, such as in the area of evaluation of low-temperature immobilization technologies, and subsurface science. PNNL scientists serve on review boards and provide EM with high quality scientific and technical expertise. However, PNNL is not always effective in leveraging across PNNL to leverage research and expertise across PNNL in order to provide the best input for EM.

Objective 3.3 – Provide Efficient and Effective Communications and Responsiveness to Customer Needs: Rating is B+ or 3.4

In FY2006, PNNL was not always effective and timely in communicating scientific information and results. In many case, EM needs the technical information to make decisions on compliance issues and on critical project milestones. Therefore, timely and effective communication of project progress and results is very critical for EM management. For example, on the Seismic Borehole project status, PNNL was not effective in communicating their progress and results of the project to EM. However, after discussions with EM senior management, PNNL did take corrective actions and communications did improve.



Mark Gilbertson
Deputy Assistant Secretary for
Engineering and Technology
Office of Environmental Management

cc: D. Biancosino

Comments from Richland Operations Office

1.4 Office of Environmental Management (EM)

1.4 Office of Environmental Management (EM)

Provide for Efficient and Effective Mission Accomplishment (Quality, Productivity, Leadership, & Timeliness of Research and Development)

1.4.1 Science and Technology (S&T) Results Provide Meaningful Impact on the Field (Impact)

During FY06, Pacific Northwest National Laboratory (PNNL) provided critical S&T solutions to some of U.S. Department of Energy (DOE) EM's most pressing technical challenges in the areas of radioactive waste treatment and waste form validation, groundwater remediation, spent nuclear fuel sludge treatment, and double-shell tank (DST) integrity. This work enabled decisions that reduce technical uncertainty and protect human health and the environment. Highlights of scientific and technological accomplishments and their impacts are provided below.

PNNL researchers are resolving seismic issues that are impacting construction of Hanford's vitrification plant. PNNL is leading the Hanford Waste Treatment Plant (WTP) Seismic Boreholes project to reduce the uncertainty associated with shear wave velocities of sediments and basalts below the WTP. This uncertainty has called into question the adequacy of the current seismic design criteria for the WTP. Efforts in FY06 focused on installing the deep boreholes and gathering initial geophysical data from the subsurface.

PNNL's expertise in geology and seismology is helping reduce the uncertainty through drilling, sampling, and in situ measurements below the WTP. The information obtained, to be delivered in spring 2007, will be used by DOE and external reviewers to validate the seismic design criteria and assure restart of construction of two of the WTP facilities.

PNNL researchers are resolving uranium mobility issues in the 300 Area. PNNL provided the subsurface geology and uranium distribution data necessary to establish a defensible remediation approach to contaminated groundwater in the 300-FF-5 groundwater operable unit. PNNL performed laboratory studies to better understand the mobility and subsurface transport of uranium.

The previous record of decision predicted that the uranium groundwater plume moving through the soil towards the Columbia River would dissipate; however, the plume has persisted and active remediation may be necessary. Using the latest research equipment in field experiments, PNNL provided the information necessary to determine the best approach for remediating the groundwater. This information will soon be available through open scientific literature, providing valuable information to others dealing with uranium-contaminated groundwater.

In addition, research results are being incorporated directly into an EM-22-funded project to evaluate the efficacy of polyphosphate injections to stabilize uranium in the subsurface of the 300 Area. The technology is based on injection of fluids to form reactive minerals in the

1.4 Office of Environmental Management (EM)

subsurface that react with and immobilize uranium. The EM-22 project will perform a treatability test to evaluate field-scale injection of a polyphosphate solution.

Data obtained from this study will be used to develop cost estimates for full implementation, identify technical challenges, and evaluate the ability of the technology to meet remedial objectives.

RL Assessment Comments:

PNNL's work on the 300 area Uranium mobility issues has been outstanding. The regulator and stakeholder community have expressed a high level of confidence in the work being conducted by PNNL. This effort will be a significant contribution to achieving final cleanup decisions in the 300 area.

PNNL researchers analyze the bulk vitrification (BV) form and processes to understand long-term performance. To augment WTP throughput capabilities, PNNL completed testing and analyses to answer questions regarding waste form acceptability for the BV process, which is a possible supplemental treatment for the low-activity fraction of Hanford's tank waste. Specific accomplishments include the following:

- Completed testing and source-term modeling that helped establish the impact of metal inclusions in BV glass. This testing and modeling helped establish the quantity of metal inclusions that can be present in the BV product without impacting the final waste form.
- Developed statistically valid methods to establish the rhenium concentration in the refractory portion of full-scale BV waste packages and tested the method using samples from an early full-scale simulant melt. Accurately measuring the amount of rhenium in the full-scale non-radioactive melts is a key step in establishing the ability of the BV process to vitrify waste with acceptable technetium leaching behavior.
- Completed the plans, in collaboration with CH2M HILL Hanford Group, Inc. (CH2M HILL) to support the U.S. Environmental Protection Agency Determination of Equivalent Treatment and waste form compliance for BV.
- Acquired additional understanding of the behavior of technetium in the BV process and conducted several tests that established that molten salt migration is the dominant mechanism for transport of technetium into the refractory. PNNL also established potential process modifications that can be used to decrease the extent of salt migration.
- Developed and tested simulants for an FY07 demonstration of the process on waste from Hanford's Tank S-109 tank.

These accomplishments allow scientists and regulators to understand the long-term performance of the vitrified waste form, a critical step to obtaining state permits for supplemental treatment of tank waste.

1.4 Office of Environmental Management (EM)

PNNL researchers provided critical subsurface data for remediation and tank closure. In response to *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement or TPA) milestones, PNNL characterized nearly 300 samples of the vadose zone near the site's underground radioactive waste tanks to determine the nature and extent of contamination and waste migration pathways.

The PNNL-produced characterization data provided the scientific underpinning for risk assessment modeling and calculations, which is essential to making decisions about vadose zone remediation and tank farm closure.

PNNL researchers develop control process for grouting nuclear sludge. Four cubic meters of contact-handled uranium-based fuel sludge in the North Loadout Pit of the K-East Basin were successfully treated in FY06 using a control process conceived and developed by PNNL. The Laboratory used computer models to show that a commercially available instrument could be used to develop and optimize a grout-based waste form, poured into drums, that was acceptable for offsite disposal. The process and equipment were turned over to Fluor Hanford, Inc., who successfully processed the waste.

By providing innovative approaches and technical support, PNNL assisted in greatly lowering the dose to Fluor Hanford workers and reducing the number of waste drums and the associated costs.

PNNL researchers analyze seismic and thermal integrity of DSTs. Using advanced computing capabilities, PNNL performed a three-year seismic analysis of Hanford's DSTs. Seismic analyses were conducted to predict the impacts of increasing the liquid level limits in the DSTs to accommodate additional single-shell tank retrievals.

PNNL's approach replaced traditional analyses (response spectra linear analysis) and created a defensible technical approach to predict tank behavior over time that could lead to extending the service life of the DSTs. In addition, this work assisted DOE in meeting TPA milestones.

1.4.2 Provide Quality Leadership in S&T (Leadership)

PNNL delivered innovative solutions and programs to address EM's key technical challenges associated with groundwater treatment, facility demolition, and waste tank seismic analysis. Examples are described below.

PNNL provides Chief Process Engineer and technical support to WTP. PNNL was selected for a leadership role in support of the design and startup of the WTP. Working within the Bechtel National, Inc. engineering organization, PNNL provided the Chief Process Engineer responsible for finalizing and increasing the throughput of the WTP process systems. The Chief Process Engineer focuses on supporting the development and implementation of plans for resolving the identified technical recommendations of the External Flowsheet Review Team report. In addition, PNNL staff are providing the technical leadership to oversee the design and planned commissioning of the WTP. This work includes overseeing key design elements and technology

1.4 Office of Environmental Management (EM)

programs, modifying technical requirements in the WTP contract as needed, and resolving critical DOE program issues.

In a supporting role, PNNL is providing quality S&T leadership and aligning core competencies in process chemistry, process engineering, waste form development, and tank chemistry with the needs of the WTP.

PNNL continues to demonstrate leadership in integrating DOE Office of Science (SC) science with EM issues. PNNL coordinated a two-day technical exchange focused on technical issues and progress at three EM High-Level Waste (HLW) sites and featured presentations and roundtable discussions by the hands-on field engineers and project managers. The exchange provided a forum for sharing experiences, successes, and lessons learned for remediating nuclear tank waste (as described in Section 3.4.1).

PNNL demonstrates leadership on the Savannah River Site salt waste project review. PNNL was selected by DOE as the scientific and technical lead for the Independent Technical Review of the Preliminary Design of the Salt Waste Processing Facility to be built at the Savannah River Site. This facility is analogous to the Pretreatment Building at WTP. This review is one of a series of major project reviews that DOE has initiated after recognizing the benefits from the "Best and Brightest Review" of the WTP. PNNL is providing the technical leader for the 22-member team, leading the Civil/Structural Sub Team, and providing mechanical design review support to the Engineering Sub Team. In addition, the team completed *Savannah River Site Salt Waste Processing Program: Fiscal Year 2006 Technology Development Program Plan*, December 2005.

This team provided key information to DOE decision-makers who will authorize final design and construction of the Salt Waste Processing Facility.

PNNL provides technical leadership on Hanford groundwater and vadose zone integration. PNNL supported DOE-Richland Operations Office's (RL's) and DOE-Office of River Protection's (ORP's) new initiative to integrate all groundwater and vadose zone work at the Hanford Site. This support includes oversight of integrated project teams that address integration of all field work conducted for tank farms, waste sites, and groundwater to address commingled plumes and coordinated investigations and actions.

This support fosters the application and further development of innovative characterization methods such as high-resolution resistivity and directly supports the Assistant Managers for Central Plateau, River Corridor, and Tank Farms in developing an integrated set of priorities and schedules for field investigations.

RL Assessment Comments:

PNNL is providing superior support for the Groundwater and Vadose Zone Integration initiative. PNNL's assistance has made the integrated project teams very effective in addressing key integration issues between Tank Farms, Groundwater, Waste Sites and the River Corridor.

PNNL researchers pursue challenging science on unique nuclear waste. PNNL characterized and analyzed samples of remote-handled sludge in the K-Basins to better understand the behavior of the sludge, which is the most challenging waste in the basin system. Hanford contractors are developing treatment processes for this waste based on the uranium chemistry and the flow behavior of this mud-like material. The information obtained will provide the technical basis to bound the safety conditions during retrieval and treatment.

PNNL's work provided the technical foundation supporting the process engineering and safety basis documentation for treating the K-Basin remote-handled sludge. Based on these analyses of a unique waste form, the Hanford contractor will retrieve and treat the sludge, which is currently sitting in a leak-prone basin near the Columbia River.

PNNL researchers pursue a novel approach to contain radiation during open-air building demolition. PNNL's predictions of atmospheric dispersions enabled the successful demolition of a plutonium-contaminated incinerator building near Hanford's Plutonium Finishing Plant (PFP). The greatest uncertainty during demolition relates to the fate of contaminants in the building, and the question of whether the material dispersed by demolition activities will be maintained within established boundaries. This uncertainty drives costs up and extends schedules as project managers strive to reduce levels of contamination that is progressively more difficult to access and remove. PNNL used air-dispersion models to define how clean the building had to be before open-air demolition could begin.

The PNNL air-dispersion modeling reduced the uncertainty associated with demolition activities and, thus, reduced demolition costs and allowed the work to be completed on schedule. The building was successfully demolished, without exposing workers or the environment to unacceptable contamination levels.

PNNL receives EM awards for innovative groundwater treatment approaches. With strong roots in the Environmental Management Science Program and the Environmental Remediation Science Program (ERSP) investments, the quality of PNNL's science was recognized with the award of slightly more than half of the \$10M from EM's Columbia River Protection Supplemental Technologies Project to stop chromium, strontium, uranium, and carbon tetrachloride in the groundwater from reaching the Columbia River. This is part of a effort funded by EM's Columbia River Protection Supplemental Technologies Project.

Under the Bioremediation of Chromium and Nitrate at 100-D Area project, PNNL will conduct field-scale tests at Hanford's former 100-D reactor by stimulating in situ subsurface microbes to create a reducing environment upgradient of the In Situ Redox Manipulation barrier. This environment will treat chromium, nitrate, and other materials, thereby increasing the barrier's longevity, and protecting shoreline vegetation and the downstream human population.

Under the Geochemistry of Chromium in the Vadose Zone project, PNNL will determine mechanisms responsible for retention of chromium in the vadose zone of the 100 Areas. With this information, researchers and regulators can build remediation plans based on the actual behavior of the chromium.

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Under the Surface Infiltration of Apatite Solution project, PNNL will provide the scientific foundation to affordably place, near the river, a long-lasting apatite barrier that will sequester strontium in groundwater until it decays. Under the Phytoremediation project, PNNL will determine the efficacy of using native coyote willows to remove strontium from groundwater at the 100-N Area. The willows' roots would draw up the strontium; the plants would be harvested twice a year and disposed.

Under the Uranium Stabilization through Polyphosphate project, PNNL will test the distribution and other properties of a soluble long-chain polyphosphate to halt the uranium plume under Hanford's 300 Area.

Under the Carbon Tetrachloride Attenuation project, PNNL will determine how carbon tetrachloride and chloroform, which make up a plume emanating from the 200-West Area, react with water under ambient groundwater conditions. This will help define how much active remediation may be needed and estimate where the plume will stabilize.

This work will help protect the Columbia River from radionuclide and chemical contamination.

RL Assessment Comments:

PNNL has been very effective in working with DOE and the other contractors to develop and implement innovative treatment approaches that will be a significant contribution to final site cleanup and protection of the Columbia River.

PNNL provides thought leadership on developing membranes for caustic recycling. Adding caustic solutions during waste processing at WTP has significantly added to the amount of low-activity waste that must be produced, increasing the cost of the mission. Ceramtec, Inc. received a congressional earmark to develop a sodium-selective ceramic membrane. PNNL provided technical leadership to Ceramtec to direct development of the membrane for application within a caustic recycle process for Hanford.

Through PNNL's understanding of Hanford processing issues, the earmark to Ceramtec is being directed to develop a new process that could recycle caustic added during HLW processing, thereby reducing the amount of low-activity waste that must be produced, and reducing the cost to complete the Hanford mission.

PNNL delivers state-of-the-art measurement of radiological dose to workers. PNNL provides all Hanford contractors with a broad suite of radiological measurement and calibration services enabling them to meet commitments in support of EM's Hanford cleanup mission and improve operational safety and efficiency. PNNL has responded to new technical challenges that arise as cleanup activities move forward and present problems never before encountered. For example, PNNL conducted instrumentation studies to develop methods for detecting hard-to-detect radionuclides. Other examples are as follows:

- Dosimetry studies supporting improved site operations:

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- Developed facility-specific calibration factors for more precise neutron dosimetry.
 - Developed technical bases and methods for wearing dosimetry with leaded gloves, lead vests, or inside personal protective equipment.
 - Evaluated different types of leaded gloves for balancing a reduction in extremity exposure with the need for dexterity.
 - Studied the relationship between the responses of portable survey instruments to dosimetry in mixed beta/gamma fields to better synchronize the results for more accurate estimation of exposure during high-risk jobs.
 - Studied radiation field characterization around equipment associated with gloveboxes or hot cells, or in unusual locations to allow for better work planning to support reduced radiation exposure.
- Instrumentation studies to support site operations:
- Performed special calibrations of instruments used to detect radionuclides of interest with specific geometries.
 - Identified manufacturing problems on high-contamination detectors used at PFP. Suggested solution for manufacturer to correct this problem and retrofitted existing units.
 - Reviewed instrument reliability and whether calibration intervals were appropriately established for the Hanford instrument pool.
 - Verified that hose extensions do not negatively affect the calibrated flow rate on air samplers.
 - Set up a wide-area system to rapidly screen large ground surfaces to identify buried waste in the 300 Area.

By providing DOE with an accurate and defensible dosimetry program, PNNL assisted the contractors in protecting their workers.

1.4.3 Provide and Sustain S&T Outputs that Advance Program Objectives (Output)

This measure has been deleted from the EM performance measures by agreement with Mark Gilbertson, EM-20.

1.4.4 Provide for Effective Delivery of S&T (Delivery)

PNNL provided on-time delivery of high-quality products and services to its EM customers. The Laboratory implemented corrective actions to assure milestones for critical projects were met. PNNL also developed and implemented a process to review project schedules and deliverables to assure that the Laboratory meets or exceeds our customers' expectations and have schedule or quality issues. Key examples of on-time delivery of high-quality products are described below:

PNNL implements drilling contracts for WTP seismic project. For the PNNL-led WTP Seismic Boreholes project, the Laboratory established formal cost and schedule baselines with DOE's concurrence, clarified expectations for schedule acceleration with senior DOE HQ and ORP management, and provided regular progress reports across all levels of DOE and external

1.4 Office of Environmental Management (EM)

advisory groups. The project is on schedule for delivery of critical data to support assessment of the seismic design criteria for the WTP (as reported in Section 1.4.1).

PNNL researchers analyze the integrity of DSTs. PNNL completed and submitted an analysis of record for the Hanford DST Integrity Program, completing TPA milestone M-48-14. An external review of the work was conducted and the findings and reports have been forwarded to the Defense Nuclear Facilities Safety Board by CH2M HILL (as reported in Section 1.4.1).

PNNL developed groundwater data packages. PNNL delivered eight data packages, one for each key modeling element supporting the Hanford Remediation Assessments project. These data packages were developed under strict quality assurance procedures and were placed under configuration control. The packages were delivered to DOE on time.

These data sets provide the technical underpinnings for modeling performed to support remediation decisions at the Hanford Site and elements are being used to support the Tank Closure and Waste Management Environmental Impact Statement.

RL Assessment Comments:

Per DOE direction, PNNL successfully delivered the data packages and full documentation of multiple years efforts. This complete documentation provides an archive and important set of reference material for future assessment work to support final cleanup decisions on the site.

PNNL delivered the Hanford Solid Waste Forecast. PNNL provides the Solid Waste Forecast for DOE in an annual report. The Hanford Site receives solid waste of many types and forms from generators across the United States. Key elements of managing this service are forecasting the waste to be received and providing the relevant information that allows the DOE waste management contractor to plan disposal activities and treatment processes. PNNL also provides insight to alternative scenarios for solid waste so that managers have the opportunity to evaluate the robustness of their planning assumptions. This forecast is provided annually, and alternatives are developed as requested.

The annual delivery of the Solid Waste Forecast enables DOE to effectively and efficiently manage Hanford Site waste treatment processes and disposal options.

PNNL developed annual reports on Hanford environmental conditions on time. PNNL completed, on schedule, three annual reports providing detailed information on the Hanford Site. The *Hanford Site 2005 Groundwater Monitoring Report*, required annually by the *Resource Conservation and Recovery Act of 1976 (RCRA)* regulations, is the most comprehensive collection of information and data on the status of groundwater contamination at the Hanford Site. The *Hanford Site Environmental Report*, required under DOE Order, documents compliance with radiation protection requirements. The *Annual Hanford Seismic Report for Fiscal Year 2005* provides high-quality raw and processed seismic data for the Hanford Site and vicinity, and discusses the source of the earthquakes.

These reports support compliance with DOE Orders and RCRA.

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3.4 Office of Environmental Management (EM)

Provide Effective and Efficient Science and Technology Research Project/Program Management

PNNL applies science-based leadership in project and program planning and execution to the development of high-impact S&T to support execution of EM's mission. During FY06, PNNL has led S&T projects and programs by helping to apply DOE-SC capabilities, facilities, and programs to address EM's technical needs. The Laboratory also led efforts to establish a plan for turnover of Hanford 300 Area EM facilities and equipment occupied by SC. PNNL facilitated a key technical exchange between SC and EM to discuss Hanford groundwater modeling and simulation, and developed strong technical approaches to understanding Hanford Site groundwater flow in response to a congressional request to EM.

3.4.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Programmatic Vision

PNNL works closely with DOE and its contractors to understand EM's needs and is investing in capabilities necessary to mitigate future technical risks and uncertainties in the programs. PNNL supports the newly formed EM Office of Engineering and Technology (OET), the DOE Field Offices, and DOE's contractors by providing high-impact solutions to their most pressing technical challenges. As a DOE-SC national laboratory, PNNL is in a unique position to identify opportunities to bring SC capabilities to bear on EM mission needs. Examples highlighting PNNL's S&T stewardship and programmatic vision are described below.

PNNL aligns its investments and resources with the DOE environmental strategy. During FY06, PNNL undertook a Laboratory-wide activity to align research programs, staff capabilities and internal investments with the DOE's strategic plan, including DOE EM's legacy waste issues. In addition, PNNL invested in staff capabilities through the Environmental Biomarkers Initiative, which is designed to provide a more efficient and timely approach to contaminant detection issues.

By further aligning investments and resources with EM's needs, PNNL has helped to strengthen the SC and EM interface.

PNNL demonstrates leadership in integrating SC science with EM issues. PNNL facilitated a two-day technical exchange in November 2005 with the SC to plan for a joint EM-SC initiative on enhanced computing to support subsurface modeling. Members of a SC committee funded through the Scientific Discovery through Advanced Computing (SciDAC) Program met with the DOE Field Office, Hanford contractors, and PNNL to review the modeling approach used at the Hanford Site. As a result of this workshop, the SciDAC call for proposals included a focus on groundwater modeling.

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By linking EM with SC's SciDAC Program, PNNL is enabling a greater understanding of the merits of new subsurface transport and flow modeling tools, leading to more cost-effective solutions to Hanford's groundwater contamination problems.

RL Assessment Comments:

PNNL did an excellent job of working with SC and the DOE Field office and contractors to support the technical exchange with SciDAC.

PNNL interfaces with SC to help resolve EM groundwater challenges. PNNL successfully proposed a project to understand the carbon tetrachloride plume in Hanford's 200-West Area. Funded by ERSP, this work is focused on the behavior of non-aqueous phase liquids as they relate to groundwater contamination. The project is based on experimental work funded through the Remediation and Closure Science Project by DOE-EM Richland Operations.

This work links SC resources with EM needs, specifically in the groundwater contamination area. This effort will provide additional scientific underpinnings and new approaches to address existing Hanford Site groundwater remediation issues.

RL Assessment Comments:

PNNL has been very successful in leveraging Science and Technology (S&T) initiatives to support needed S&T to support Hanford Site remediation efforts.

PNNL proposal funded to optimize groundwater models. PNNL was selected by DOE to lead a SciDAC-funded effort to integrate groundwater modeling computer programs and optimize them to run on supercomputers.

This work will help resolve issues of scale in groundwater modeling; that is, different models focus on different scales. Some focus on reactions that occur within minutes and cover several molecules, while others, reactions that occur over centuries and cover hundreds of meters.

RL Assessment Comments:

The work by PNNL on this SciDAC initiative may yield significant benefits in model optimization in the next several years

PNNL conducts field-scale research on uranium in 300 Area soil. In response to the DOE-SC Program Announcement Lab 06-16 for the ERSP, PNNL submitted a proposal for an Integrated Field-Scale Subsurface Research Challenge study and site in the 300 Area. The project will investigate field-scale issues related to uranium reactive transport in the vadose zone, groundwater, and as it discharges to the Columbia River. This proposal, supported by DOE-RL, is in concert with the limited field investigation being performed for the 300-FF-5 groundwater operable unit and the EM-20-funded evaluation of uranium remediation.

1.4 Office of Environmental Management (EM)

This work will support the final remediation of the uranium plume in the Hanford Site's 300 Area groundwater.

RL Assessment Comments (Provided by Briant Charboneau):

This effort by PNNL will be a very useful contribution to the 300 Area Uranium issue.

3.4.2 Provide Effective and Efficient S&T Project/Program Planning and Management

PNNL is providing effective project and program management by working with EM and SC to determine where national laboratories can best provide input to EM program plans and to identify opportunities for collaborative research programs. With the establishment of EM's OET, PNNL is working collaboratively with DOE and the other national laboratories to provide additional focus on the multi-year S&T planning necessary to address EM mission needs, as described below.

PNNL participates on EM's National Lab Advisory Group (NLAG). In collaboration with three other national laboratories (Savannah River, Oak Ridge, and Idaho), PNNL is supporting the development of the OET's S&T Plan, which is looking at how to better use and better integrate the resources of the national laboratories to support the EM mission. In addition, PNNL is leading the NLAG effort in soils and groundwater.

With a clear understanding of the challenges presented in the upcoming EM's OET 10-Year S&T Plan, DOE can align capabilities to reduce the technical risk and uncertainty associated with the nation's toughest environmental challenges. In addition, the information provided by NLAG will help DOE identify opportunities to integrate subsurface science and waste processing research across laboratories and across funding sources.

RL Assessment Comments:

PNNL's efforts in this endeavor will help secure additional S&T that addresses Hanford related issues.

PNNL provides technical leadership and assistance in assisting DOE-RL, and Fluor Corporate in performing project risk assessments and analysis. Their unique technical knowledge of Hanford Cleanup challenges along with their risk and decision making capabilities have been valuable. This work initiated during early Fiscal Year 2005 included performing assessments and analysis utilizing Pertmaster™ software, utilizing stochastic Monte Carlo methodology, to identify high medium and low risk areas at a minimum 80% confidence level for the PFP and KBC projects as required by DOE M413.3-1. This work was significant in that quantification of the project cost and schedule risks for both projects resulted in helping both projects pass the External Independent Review (EIR). The final EIR report included observed best practices, identified that DOE-RL's Risk Management Plans implement a vigorous risk management program, and stated that the DOE-RL and contractor

1.4 Office of Environmental Management (EM)

risk management programs are highly developed and appear to be effective in identifying, assessing, and quantifying risks as well as implementing mitigation and assigning contingencies at a mature level. PNNL is also making progress to in mentor and impart the transition of effective risk management knowledge and capabilities DOE-RL project offices. Risk management is also provided a solid basis for science and technology needs for Hanford Cleanup.

PNNL provides S&T expertise to project reviews at Savannah River and Hanford. Based on the Laboratory's experience with nuclear waste and vitrification, PNNL researchers were selected for leadership roles on independent review committees. PNNL was selected by DOE as the S&T lead for the Independent Technical Review of the Preliminary Design of the Salt Waste Processing Facility to be built at the Savannah River Site. PNNL is providing the technical leader for the review, the lead for the Civil/Structural Sub Team, and a mechanical design expert for the Engineering Sub Team.

PNNL personnel served in a supporting role for the WTP Project External Flowsheet Review Team that was chartered to determine the flowsheet's adequacy to meet the contract throughput requirements. PNNL provided oversight on the technical issues, based on the Laboratory's extensive process knowledge. Also, PNNL provided technical coordination of the final reports.

By serving on these review boards, PNNL is helping to provide decision-makers with high quality, technically grounded scientific and technical information.

PNNL organizes and hosts annual collaborative technology information exchange. For DOE's ORP, PNNL organized and hosted the 5th annual technical exchange in May 2006. The exchange focused on technical issues and progress at three EM HLW sites and featured presentations and roundtable discussions by the hands-on field engineers and project managers.

The technical exchange provided a forum for sharing experiences, successes, and failures, from tank retrievals and operations. Common needs for technical advances in the areas of saltcake retrieval, sludge mixing and sampling, tank vapors safety issues, tank closure, and alternative waste processing were identified and emphasized.

PNNL evaluates secondary waste form immobilization technologies. In support of EM, PNNL is analyzing low-temperature immobilization technologies. Vendors for three technologies have immobilized simulated waste, and PNNL tested the samples for strength and contaminant retention performance criteria.

This project provides alternatives for secondary waste immobilization such as from vitrification off-gas or other waste streams from the primary HLW treatment process.

PNNL researchers identify and resolve WTP technical risks. Further evidence of PNNL's ability to align significant capabilities and deliver quality technical solutions is reflected in the Laboratory's long-term commitment to mitigate technical risks for the design and startup of the WTP. (See Section 1.4.1.)

1.4 Office of Environmental Management (EM)

3.4.3 Provide Efficient and Effective Communication and Responsiveness to Customers Needs

PNNL has been responsive to customer requests for information and proactive at building relationships and effectively communicating opportunities for integrated research across DOE programs. In response to product quality and communications issues identified in FY05, PNNL has improved its communication with, and response to, customer needs, as described below.

PNNL implements process for receiving continuous performance feedback. With OET, PNNL implemented a pilot program to obtain accurate, insightful quarterly performance feedback from EM. Under the new program, PNNL meets regularly with the site program managers to discuss the feedback on the previous quarter's performance. PNNL provides quarterly progress reports to EM on the input. Key managers then meet with EM to discuss the input, rectify any problems, and discuss further opportunities. PNNL, DOE, and the Pacific Northwest Site Office routinely discuss performance expectations and progress, providing accurate and timely information to key customers. The Laboratory has also developed a process for collecting performance feedback. In FY06, PNNL sent out nearly 250 individual requests for performance feedback from major project customers.

While the customer feedback survey results use a numerical rating system rather than the DOE adjectival rating system, the results of the feedback surveys and direct interactions with key customers indicate that our customers rate the quality and timeliness of PNNL's scientific and technical work as "Excellent" to "Outstanding." Additionally, we have received no customer feedback that required direct management intervention during the FY06 customer feedback collection process. PNNL has worked hard during FY06 to overcome performance deficiencies identified in previous years.

PNNL implements proactive WTP Seismic Project communications practices. To ensure effective communication of technical progress and technical and programmatic issues with DOE-ORP, the U.S. Army Corps of Engineers, and DOE-HQ, PNNL has established daily updates and detailed weekly reporting for the WTP Seismic Boreholes project. In addition, weekly schedule updates and monthly earned-value reporting have been implemented to assure frequent and timely communication of cost and schedule performance. These actions assure that PNNL's customers remain informed about all aspects of this critical project.

PNNL develops communication performance improvements. In response to communication concerns and performance issues identified in FY05, PNNL developed an EM relationship action plan to rebuild key relationships and re-emphasize our commitment to EM's success. The relationship plan clearly assigns roles and responsibilities, aligns Laboratory staff from the Laboratory Director through the Associate Laboratory Director for Environmental Technology and the Division Directors to the various Relationship Managers and missions with appropriate customer contacts.

Through the action plan, PNNL has made it easier to determine who to contact at the Laboratory to respond to and resolve EM technical issues. In addition, the plan has provided more effective, efficient, and frequent communications with our key DOE customers, thereby allowing for a

1.4 Office of Environmental Management (EM)

better understanding of our customer's critical issues and needs, and faster resolution of problems as they arise.

Comments from Office of River Protection

United States Government

Department of Energy
Office of River Protection

memorandum

DATE: November 6, 2006
REPLY TO: ORP:SJO 06-ORP-043
ATTN OF:
SUBJECT: THE U.S. DEPARTMENT OF ENERGY, OFFICE OF RIVER PROTECTION
(ORP) INPUT FOR FISCAL YEAR (FY) 2006 ENVIRONMENTAL
MANAGEMENT EVALUATION OF THE PACIFIC NORTHWEST NATIONAL
LABORATORY (PNNL)
TO: Mark Gilbertson, Deputy Assistant Secretary
for Environmental Cleanup and Acceleration, EM-20, HQ

In response to your request for input on the October 2005 through September 2006 (FY2006) evaluation of PNNL, please find the ORP input attached.

During FY 2006, PNNL contributed to overall research and development needs of the ORP mission in the areas of radioactive waste treatment and waste form validation, resolving seismic issues, Tank Closure and Waste Management Environmental Impact Statement support, and double-shell tank integrity. We have focused the evaluation on these areas against the Performance Goals and their corresponding Performance Objectives in accordance with the Office of Science Guidance.

The timely resolution of technical issues should be a major focus for improvement. Examples of technical issue areas where timely resolution is necessary include resolving the Tc-99 mass balance for the Demonstration Bulk Vitrification System, identifying a suitable anti-foam agent for the Waste Treatment and Immobilization Plant (WTP) that does not result in hydrogen or other flowsheet issues. The evaluation report also noted that senior DOE management involvement was needed upfront on the WTP seismic project since initially it was not proceeding satisfactory.

We thank you for the opportunity to provide input into this process. If you have further questions regarding this input, please contact Shirley Olinger, ORP Deputy Manager (509) 372-3062.



Roy J. Schepens, Manager
Office of River Protection

ORP:SJO

Attachment

cc w/attach:
D. Biancosino, PNSO

**Pacific Northwest National Laboratory (PNNL) Fiscal Year (FY) 2006 Evaluation
Input from the U.S. Department of Energy (DOE), Office of River Protection
(ORP).**

**1.0 Provide for Efficient and Effective Mission Accomplishment (Quality,
Productivity, Leadership, & Timeliness of Research and Development)**

During FY06, PNNL contributed to overall research and development needs of the ORP mission in the areas of radioactive waste treatment and waste form validation; resolving seismic issues, Tank Closure (TC) and Waste Management (WM) Environmental Impact Statement (EIS) support, and double-shell tank integrity. This work enabled decisions that reduce technical uncertainty and protect human health and the environment. Highlights of scientific and technological accomplishments for the ORP are provided below.

1.1 Science and Technology Results Provide Meaningful Impact on the Field

PNNL researchers are resolving seismic issues that are impacting construction of Hanford's vitrification plant. PNNL is leading the Hanford Waste Treatment and Immobilization Plant (WTP) Seismic Boreholes project to reduce the uncertainty associated with shear wave velocities of sediments and basalts below the WTP. Determination of shear wave velocity at depth may permit decreases in the current seismic design criteria, which were increased in 2005 to bound the effects of different credible shear wave velocities. In addition, the information gained will be used to update the 1996 Hanford probabilistic seismic hazard analysis. Efforts in FY06 focused on installing the deep boreholes and gathering initial geophysical data from the subsurface.

PNNL's expertise in geology and seismology is helping reduce the uncertainty through drilling, sampling, and in situ measurements below the WTP. The information obtained, to be delivered in spring 2007, will be used by DOE and external reviewers to validate the seismic design criteria and assure restart of construction of two of the WTP facilities.

PNNL TC and WM EIS Support. These data sets will provide the technical underpinnings for modeling to be performed to support remediation decisions at the Hanford Site and will be used to support the TC and WM EIS.

In the first quarter of FY2006, PNNL staff response to initial CFEST data requests were not timely and on occasion the data provided was not on the date requested. This had minor impact to the overall EIS schedule. Following reaching settlement over the Hanford Solid Waste-EIS was signed in January 2006, PNNL staff responsiveness to data requests improved. Specifically, requests for field data and computer code information was delivered on time and matched the information being requested.

PNNL researchers analyze the bulk vitrification (BV) form and processes to understand long-term performance. To augment WTP throughput capabilities, PNNL completed testing and analyses to answer questions regarding waste form acceptability

for the BV process, which is a possible supplemental treatment for the low-activity fraction of Hanford's tank waste. Specific accomplishments include the following:

- Completed testing and source-term modeling that helped establish the impact of metal inclusions in BV glass. This testing and modeling helped establish the quantity of metal inclusions that can be present in the BV product without impacting the final waste form.
- Developed and tested low and no-iron glass formation.
- Developed statistically valid methods to establish the rhenium concentration in the refractory portion of full-scale BV waste packages and tested the method using samples from an early full-scale simulant melt. Accurately measuring the amount of rhenium in the full-scale non-radioactive melts is a key step in establishing the ability of the BV process to vitrify waste with acceptable technetium leaching behavior.
- Completed the plans, in collaboration with CH2M HILL Hanford Group, Inc. (CH2M HILL) to support the U.S. Environmental Protection Agency Determination of Equivalent Treatment and waste form compliance for BV.
- Acquired additional understanding of the behavior of technetium in the BV process and conducted several tests that established that molten salt migration is the dominant mechanism for transport of technetium into the refractory. PNNL also established potential process modifications that can be used to decrease the extent of salt migration.
- Developed and tested simulants for an FY07 demonstration of the process on waste from Hanford's Tank S-109 tank.

These accomplishments allow scientists and regulators to understand the long-term performance of the vitrified waste form, a critical step to obtaining state permits for supplemental treatment of tank waste.

As noted in last year's evaluation, PNNL should continue to understand the fate of technetium is a critical element in the success of bulk vitrification. Any future laboratory/engineering scaled test should ensure that the mass balance of Tc-99 be a critical element in the test plan.

PNNL researchers provided critical subsurface data for remediation and tank closure. In response to *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement or TPA) milestones, PNNL characterized nearly 300 samples of the vadose zone near the site's underground radioactive waste tanks to determine the nature and extent of contamination and waste migration pathways.

The PNNL produced characterization data provided the scientific underpinning for risk assessment modeling and calculations, which is essential to making decisions about vadose zone remediation and tank farm closure.

PNNL researchers analyze seismic and thermal integrity of Double-Shell Tank (DST)s. PNNL Engineering Mechanics Group and its associates performed Seismic and Thermal Operating Load Analysis (TOLA) of the DSTs. Using advanced computing capabilities, PNNL headed a three year effort that evaluated the configuration of each DST tank farm and developed one bounding finite element model to represent all DSTs. This bounding DST used the minimum strength composite DST elements (e.g., thinnest wall thickness, lowest strength steel, etc.) subject to 60 years of maximum operating conditions (e.g., thermal cycling at the maximum rate, maximum waste temperatures, maximum specific gravity and heights, incorporating concrete cracking and creep, soil-structural interactions, and full seismic loading) in order to perform a structural analysis of the DSTs. This detailed TOLA was performed with state of the art finite element analysis techniques and provided analytical documentation of the DST system's structural integrity and its capability to support the continued operations of these tanks during waste cleanup operations at the Hanford Site. The TOLA work has established a defensible basis for DST operating specifications, and for the continued structural integrity of the DSTs through the year 2028. In addition, this work was required in order to complete an integrity assessment of the DST system for meeting TPA milestone, M-48-14. This integrity assessment is a major component of DOE's Resource Conservation and Recovery Act permit request for the DST system recently submitted to the Washington State Department of Ecology. PNNL has also been tasked to evaluate the 241-AP DSTs Tank Farms structural adequacy for increasing waste levels beyond the current operating limits. Seismic analysis was also applied to determine tank behavior with these increased levels. This report is expected sometime in November 2006.

1.2 Provide Quality Leadership in Science and Technology (S&T)

PNNL delivered innovative solutions and programs to address Environmental Management (EM)'s key technical challenges associated with groundwater treatment, facility demolition, and waste tank seismic analysis.

PNNL provides Chief Process Engineer and technical support to WTP. PNNL was selected for a leadership role in support of the design and startup of the WTP. Working within the Bechtel National, Inc. engineering organization, PNNL provided the Chief Process Engineer responsible for finalizing and increasing the throughput of the WTP process systems. The Chief Process Engineer focuses on supporting the development and implementation of plans for resolving the identified technical recommendations of the External Flowsheet Review Team report. In addition, PNNL staff is providing the technical leadership to oversee the design and planned commissioning of the WTP. This work includes overseeing key design elements and technology programs, modifying technical requirements in the WTP contract as needed, and resolving critical DOE program issues.

In a supporting role, PNNL is providing quality S&T leadership and aligning core competencies in process chemistry, process engineering, waste form development, and tank chemistry with the needs of the WTP.

PNNL provides technical leadership on Hanford groundwater and vadose zone integration. PNNL supported DOE-Richland Operations Office's (RL)'s and DOE-Office of River Protection's (ORP)'s new initiative to integrate all groundwater and vadose zone work at the Hanford Site. This support includes oversight of integrated project teams that address integration of all field work conducted for tank farms, waste sites, and groundwater to address commingled plumes and coordinated investigations and actions.

This support fosters the application and further development of innovative characterization methods such as high-resolution resistivity and directly supports the Assistant Managers for Central Plateau, River Corridor, and Tank Farms in developing an integrated set of priorities and schedules for field investigations.

1.3 Provide and sustain S&T Outputs that Advance Program Objectives and Goals

This measure has been deleted from the EM performance measures by agreement with Mark Gilbertson, EM-20.

1.4 Provide for Effective Delivery of S&T

PNNL implements drilling contracts for WTP seismic project. After ORP senior management expressed concern that the PNNL-led Seismic Boreholes project was not progressing satisfactorily, PNNL took aggressive action to remedy this deficiency. The Laboratory established formal cost and schedule baselines with DOE's concurrence, clarified expectations for schedule acceleration with senior DOE Headquarters (HQ) and ORP management, and provided regular progress reports across all levels of DOE and external advisory groups. The project is on schedule for delivery of critical data to support assessment of the seismic design criteria for the WTP.

PNNL developed groundwater data packages. PNNL delivered eight data packages, one for each key modeling element supporting the Hanford Remediation Assessments project. These data packages were developed under strict quality assurance procedures and were placed under configuration control.

PNNL researchers analyze the integrity of DSTs. PNNL completed and submitted an analysis of record for the Hanford DST Integrity Program, completing TPA milestone M-48-14. An external review of the work was conducted and the Findings and reports have been forwarded to the Defense Nuclear Facilities Safety Board by CH2M HILL.

3.0 Office of Environmental Management (EM)

Provide Effective and Efficient S&T Research Project/Program Management

3.1 Provide Effective and Efficient Stewardship of Scientific Capabilities and Programmatic Vision

3.2 Provide Effective and Efficient S&T Project/Program Planning and Management

PNNL provides S&T expertise to project reviews at Savannah River and Hanford. PNNL personnel served in a supporting role for the WTP Project External Flowsheet Review Team that was chartered to determine the flowsheet's adequacy to meet the contract throughput requirements. PNNL provided oversight on the technical issues, based on the Laboratory's extensive process knowledge. Also, PNNL provided technical coordination of the final reports.

By serving on these review boards, PNNL is helping to provide decision-makers with high quality, technically grounded scientific and technical information.

PNNL evaluates secondary waste form immobilization technologies. In support of EM, PNNL is analyzing low-temperature immobilization technologies. Vendors for three technologies have immobilized simulated waste, and PNNL tested the samples for strength and contaminant retention performance criteria.

This project provides alternatives for secondary waste immobilization such as from vitrification off-gas or other waste streams from the primary High Level Waste treatment process.

PNNL researchers identify and resolve WTP technical risks. Further evidence of PNNL's ability to align significant capabilities and deliver quality technical solutions is reflected in the Laboratory's long-term commitment to mitigate technical risks for the design and startup of the WTP.

3.3 Provide Efficient and Effective Communication and Responsiveness to Customers Needs

PNNL implements proactive WTP Seismic Project communications practices. Initially, in FY06, PNNL was not effectively communicating the Seismic Borehole project status. After discussions with ORP management, PNNL took aggressive and effective action to correct this deficiency. To ensure effective communication of technical progress and technical and programmatic issues with ORP, the U.S. Army Corps of Engineers, and DOE-HQ, PNNL has established daily updates and detailed weekly reporting for the WTP Seismic Boreholes project. In addition, weekly schedule updates and monthly earned-value reporting have been implemented to assure frequent and timely communication of cost and schedule performance. These actions assure that PNNL's customers remain informed about all aspects of this critical project.

Comments from Savannah River Operations Office

Alchowiak, Justine

From: Gilbertson, Mark
Sent: Monday, December 11, 2006 6:22 PM
To: Alchowiak, Justine
Subject: FW: PNNL Self Assessment--SR comments
Attachments: Self Assessment Final.doc

SR's comments

From: Allison, Jeffrey (SRS)
Sent: Thursday, September 28, 2006 10:17 AM
To: Gilbertson, Mark
Cc: Spader, William (SRS); terrel.spears@srs.gov; Jim.O'Connor@srs.gov; l.ling@srs.gov; Karen.Poore@srs.gov; Triay, Ines
Subject: Fw: PNNL Self Assessment

Mark,

Terry Spears of my staff reviewed the subject self assessment and offers the comment provided below. I concur with Terry's comment.

Jeff

----- Forwarded by Jeffrey Allison/DOE/Srs on 09/28/2006 10:13 AM -----

Terrel Spears/DOE/Srs

09/28/2006 09:54 AM

To: Jeffrey Allison/DOE/Srs@srs
cc: William Spader/DOE/Srs@Srs, Jim O'Connor/DOE/Srs@Srs, L
Ling/DOE/Srs@Srs, Rosetta Parker-Austin/DOE/Srs@Srs, Karen
Poore/DOE/Srs@Srs, Barbara Price/DOE/Srs@Srs
Subject: Re: Fw: PNNL Self Assessment [Link](#)

Jeff,

PNNL personnel (and in particular, Dr. Harry Harmon, Mr. Robert Leugemours and Ms. Sherry Clifford) provide ongoing technology management, maturation and integration assistance and support to DOE-SR for salt processing activities at SRS. The specialized technical support that they have provided to DOE-SR has been of high quality, timely and of significant benefit to the Salt Waste Processing Facility (SWPF) project, as well as to other salt projects at SRS. PNNL has also provided critical support for leadership and participation in an ongoing Independent Technical Review of the SWPF design. I agree with the substance of the report as it applies to SRS support, but have a minor correction to the factual accuracy of the text on page 4 as shown below.

PNNL demonstrates leadership on the Savannah River Site salt waste project review. PNNL was selected by DOE as the scientific and technical lead for the Independent Technical Review of the Preliminary Design of the Salt Waste Processing Facility to be built at the Savannah River Site (SRS). This facility is analogous to the Pretreatment Building at WTP. This review is one of a series of major project reviews that DOE has initiated after recognizing the benefits from the "Best and Brightest

Review" of the WTP. PNNL is providing the technical leader for the 22-member team, leading the Civil/Structural Sub Team, and providing mechanical design review support to the Engineering Sub Team. ~~In addition, the team completed Savannah River Site Salt Waste Processing Program: Fiscal Year 2006 Technology Development Program Plan, December 2005.~~ This team provided key information to DOE decision-makers who will authorize final design and construction of the Salt Waste Processing Facility.

In addition, PNNL technical support personnel supporting DOE completed *Savannah River Site Salt Waste Processing Program: Fiscal Year 2006 Technology Development Program Plan*, December 2005. PNNL personnel provide ongoing specialized technology management, maturation and integration services to DOE in support of salt projects at SRS.

Terry

Jeffrey Allison/DOE/Srs

09/28/2006 07:49 AM

To Terrel Spears/DOE/Srs@Srs

cc "William Spader" <William.spader@srs.gov>, Jim.O'Connor@srs.gov, L Ling/DOE/Srs@Srs, Karen.Poore@srs.gov, Rosetta Parker-

Austin/DOE/Srs@Srs, Barbara Price/DOE/Srs

Subject Fw: PNNL Self Assessment

Terry,

There are several entries, primarily on page 4, that discuss the PNNL support to SWPF. Please review and let me know whether you support the self assessment so I can close with Mark. I'd like to close by the end of the week so Let me know by tomorrow morning. Thank you.

Jeff

----- Forwarded by Jeffrey Allison/DOE/Srs on 09/28/2006 07:46 AM -----

"Gilbertson, Mark" <mark.gilbertson@em.doe.gov>

09/27/2006 10:58 AM

To "Schepens, Roy (RL)" <roy_j_schepens@rl.gov>, "Olinger, Shirley" <Shirley_J_Olinger@rl.gov>, "Klein, Keith (RL)" <keith_a_klein@rl.gov>, "Weis, Michael J" <Michael_J_Weis@rl.gov>, "Provencher, Richard B (NE-ID)" <PROVENRB@id.doe.gov>, "Allison, Jeffrey (SRS)"

<jeffrey.allison@SRS.GOV>

cc "Triay, Ines" <Ines.Triay@em.doe.gov>, "Anderson, Charles E"

<charles.anderson@em.doe.gov>

Subject FW: PNNL Self Assessment

Attached is a copy of the text of the PNNL Self Assessment (no self scoring at this time). I am responsible for providing SC with an overall assessment of the lab's performance for EM for this year. I am interested in your feedback on the performance. The majority of the support they have provided is to RL and ORP, but they have also provided support to SR and ID. We will eventually want to implement a similar type of program for SRNL to provide them with performance feedback from across the complex since they too are providing critical technical support to multiple EM sites. Mark

Alchowiak, Justine

From: Gilbertson, Mark
Sent: Monday, December 11, 2006 6:25 PM
To: Alchowiak, Justine
Subject: FW: PNNL Self Assessment-ID's comments

ID's comments

-----Original Message-----

From: Provencher, Richard B (NE-ID)
Sent: Wednesday, September 27, 2006 3:22 PM
To: Gilbertson, Mark
Subject: FW: PNNL Self Assessment

Mark, below is feedback from Bill Owca on support work PNNL provided to Idaho over the last year.

-----Original Message-----

From: Owca, William A
Sent: Wednesday, September 27, 2006 10:34 AM
To: Provencher, Richard B
Subject: RE: PNNL Self Assessment

PNNL provided excellent support to INL in the evaluation of alternative low temperature stabilization technologies. The project has been completed and a report was recently delivered. It is comprehensive and well written.

Bill Owca

-----Original Message-----

From: Provencher, Richard B
Sent: Wednesday, September 27, 2006 10:24 AM
To: Owca, William A; Van Camp, Scott G; Lockie, Keith A; Arenaz, Mark R
Subject: FW: PNNL Self Assessment
Importance: High

See attached. Any feedback on the performance of PNNL in supporting Idaho over the past year?

-----Original Message-----

From: Gilbertson, Mark [mailto:mark.gilbertson@em.doe.gov]
Sent: Wednesday, September 27, 2006 8:58 AM
To: Schepens, Roy (RL); Olinger, Shirley; Klein, Keith (RL); Weis, Michael J; Provencher, Richard B; Allison, Jeffrey (SRS)
Cc: Triay, Ines; Anderson, Charles E
Subject: FW: PNNL Self Assessment
Importance: High

Attached is a copy of the text of the PNNL Self Assessment (no self scoring at this time). I am responsible for providing SC with an overall assessment of the lab's performance for EM for this year. I am interested in your feedback on the performance. The majority of the support they have provided is to RL and ORP, but they have also provided support to SR and ID. We will eventually want to implement a similar type of program for SRNL to provide them with performance feedback from across the complex since they too are providing critical technical support to multiple EM sites. Mark

-----Original Message-----

From: Williams, Bonnie J [mailto:bonnie.williams@pnl.gov] On Behalf Of Walton, Terry L
Sent: Tuesday, September 26, 2006 3:58 PM
To: Gilbertson, Mark; Quinn, Rod K; Biancosino, David L (PNSO)
Cc: Nelson, Julie A; Walton, Terry L
Subject: PNNL Self Assessment


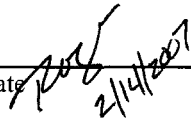

Comments from Idaho Operations Office

PNSO Concurrence Sheet

bcc w/encl:
 PD Official File
 PD Rdg File
 T. L. Davis, MGR
 R. M. Kilbury, PD

Record Note: Official Transmits FY 2006 Performance Evaluation Report for Battelle.

07-MGR-0045/ted

Concurrence	
Office & Init/Sig	
MGR/Davis	
Date	2/14/07
Office & Init/Sig.	
OD/Christensen	
Date	2/14/2007
Office & Init/Sig.	
PD/Trader	
Date	2/14/07
Office & Init/Sig.	
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DOE-PNSO-CC